CHNOLOGY DEPARTMENT

ROADS AND STREETS

AUGUST 1948

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DETROIT

"My choice is TIMKEN® every time"—Phil Savitz

Phil Savitz is the superintendent on the storm water tunnel job being driven for the city of Philadelphia by Robert Lombardi, general contractor. Mr. Savitz's full statement follows: "I have been on tunnel and other rock jobs in nearly every section of the United States and have used all types of bits. My choice is Timken every time."

When completed the Philadelphia water tunnel will be 1,800 feet long, 16 feet high and 13½ feet wide. It is being drilled through mica schist and quartz rock. Timken Rock Bits are used exclusively on the job.

Drilling is done with jumbo rigs, each mounting six, 3½ inch piston drills operating at 90 pounds of air pressure. A "drill-up" of approximately 56 holes is accomplished in 40 minutes average time.

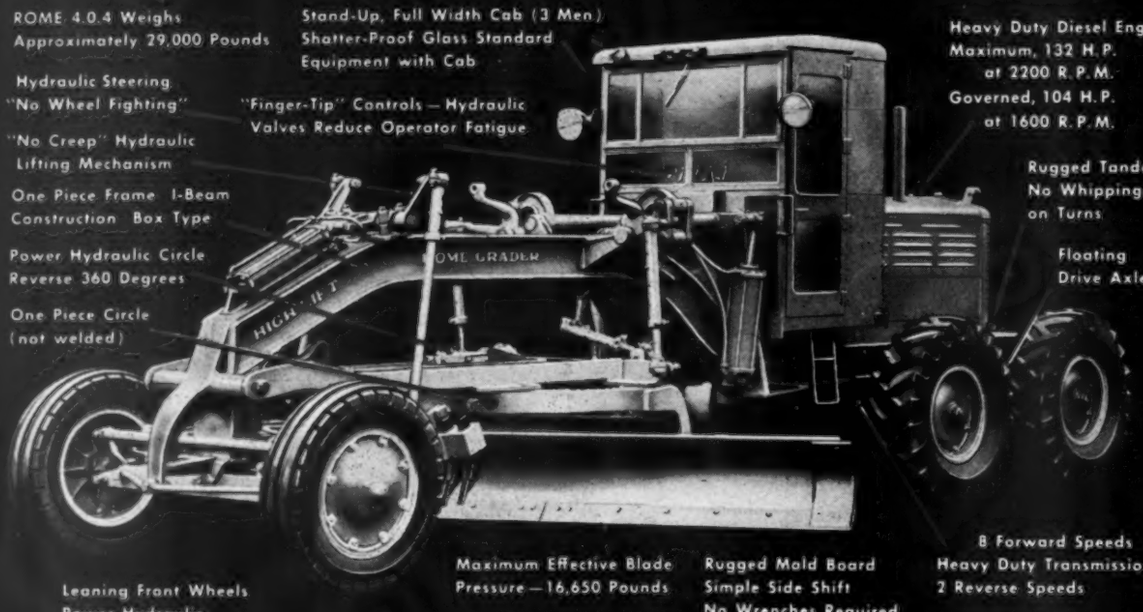
Commenting on the use of Timken Bits, Mr. T. E. Laws, general superintendent for Robert Lombardi writes: "Our past experience with your bits and the over-all economy obtained through their use were the governing factors in our decision to use them on this job. They have again proved their efficiency and economy. The drilling speed obtained through the use of Timken Rock Bits enables us to get a maximum number of "drill-ups" per day and we expect to complete the job well ahead of schedule."

There's a Timken Rock Bit distributor at the other end of your telephone. Write for his name and address. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address "TIMROSCO".

TIMKEN
ROCK BITS

It all adds up...

The Bigger the Job, the Bigger the Savings


ROME 4.0.4 Weighs Approximately 29,000 Pounds
Stand-Up, Full Width Cab (3 Men) Shatter-Proof Glass Standard Equipment with Cab
Heavy Duty Diesel Engine Maximum, 132 H.P. at 2200 R.P.M. Governed, 104 H.P. at 1600 R.P.M.
Hydraulic Steering "No Wheel Fighting"
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Power Hydraulic Circle Reverse 360 Degrees
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8 Forward Speeds Heavy Duty Transmission 2 Reverse Speeds
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ROME 4.0.4

...Unchallenged for Power

Not only does it add up to the largest and most powerful grader ever built, but costs no more to operate than the ordinary grader. ROME 4·0·4 is the easiest to operate. Every ROME operation, including steering, is accomplished by positive hydraulic pressure. There is no weaving from true course or chattering of the blade, no fighting of control levers, or whipping steering wheel.

ROME 4·0·4 responds to the operator's every wish, even under the heaviest of conditions, at a finger's touch. Fast, precise operation means more work accomplished with a minimum of effort.

•

ROME 4·0·4 Graders are proving by their performance records all over the world that costs can be cut and precious time saved.

ROME GRADER AND MACHINERY DIVISION

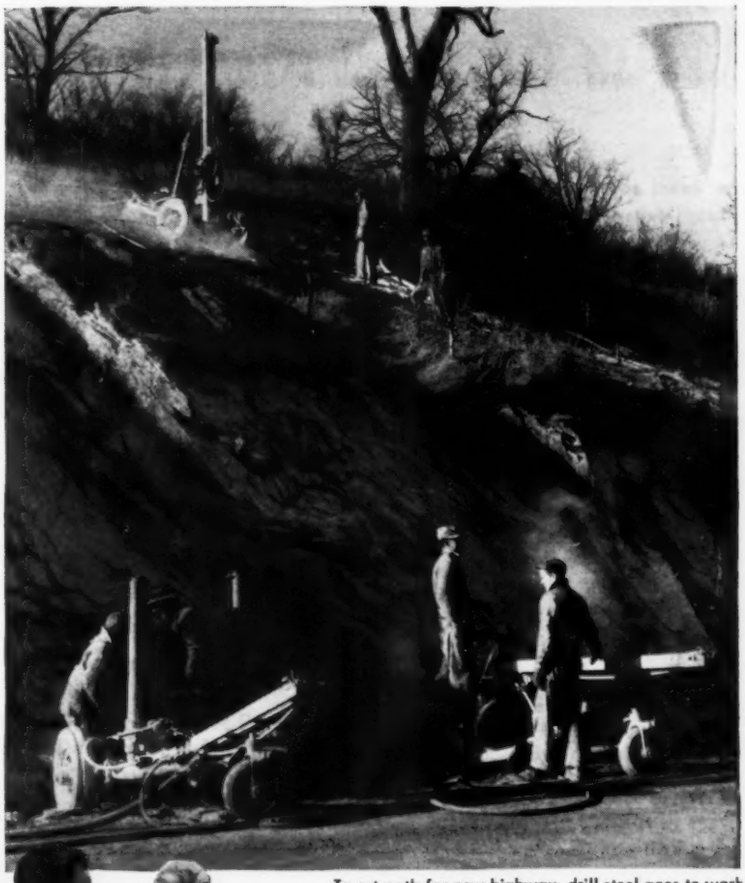
SEND

For Bulletin 4785M and the address of your nearest Rome Grader Distributor

THE UNION FORK AND HOE COMPANY . . . ROME, NEW YORK U.S.A.

Relocation Job in Eastern New York

As first step in clearing the way for 36-ft-span bridge, crawler crane, equipped with clamshell bucket and sturdy wire rope, scoops heavy load of gravel from creek bed.



To cut path for new highway, drill steel goes to work on wall of solid rock from three different angles.

Bethlehem Bar Mats, delivered from warehouse direct to job, are unloaded from truck alongside newly graded strip of road.

F. W. Jordan (left), chief engineer for S. A. Scullen, Inc., confers with F. A. Murphy, assistant engineer.

Conditions necessitated more than five miles of relocation recently on New York's much traveled Route 22, between Petersburg and North Petersburg. Construction of this new highway, part of which is shown in the accompanying pictures, was handled by S. A. Scullen, Inc., Waterford, N. Y. Bar mats for approximately 76,000 sq yd of pavement were among the steel items supplied by Bethlehem.

Placing Bethlehem Bar Mat over initial course, as skip mixes new batch.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

STEEL FOR HIGHWAYS

Dowel Units • Reinforcing Bars • Bar Mats • Guard Rail
Guard Rail Posts • Wire Rope and Strand
Hollow Drill Steel • Spikes • Bolts and Nuts • Pipe
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Fabricated Structural Steel

BETHLEHEM STEEL

ROADS AND STREETS

AUGUST, 1948 • VOL. 91 • No. 8

With Roads and Streets Have Been Combined Good Roads Magazine And Engineering & Contracting

In This Issue

Coming Articles

Fall and Winter Problems

Articles on snow removal, ice control and winter equipment servicing . . . from Pennsylvania, N. Dakota, New Jersey, Detroit, other cities and states.

Road Builders' Convention

Watch for more extended excerpts from some of the many excellent technical papers.

Contracting Problems

Subcontracting—when and how? By an author who knows the practical ins and outs.

How long and how big should the contract sections be? A nationwide summary.

Job Stories

How an eastern out-in-the-country road job was built with ready-mix trucks . . . heavy rock projects in one where TNT was used and how and why . . . hot-mix, emulsion and tar jobs.

A Contractor Suggests

How his state can cut costs on hot-mix asphalt work.

Expressway Series

Super "cross roads" at L. A. . . . progress in Pittsburgh . . . other metropolitan centers.

Street Improvement

Racine dresses up Main Street.

Also—continuing Mr. Hogentogler's thought-provoking discussions on soil mechanics . . . notes on the Portland highway meeting . . . new tricks in asphalt paving equipment . . . the new program in roadside development . . . "Something for Everybody in every Issue."

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A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations, and to the construction and maintenance of airports.

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GA-ALABAMA ROAD CONSTRUCTION COMPANY, Inc.
1601-02 COMER BUILDING
BIRMINGHAM 3, ALABAMA

Feb. 27, 1948.

Mary-Owens Machinery Co.,
Birmingham, Ala.

Attn: Mr. Purdy.

Gentlemen:

We wish to advise that we loaded 50,000 cyds. of sand clay base in twenty working days with our 3/4 Yd. Lorain 41 shovel on our FAS. S-22(2) Baldwin County project, which is 9.030 miles of road on the Point Clear-Magnolia Springs road.

Our highest daily average was 2,830 cyds. in 11 hours.

The machine is performing beautifully and we consider the above record excellent.

Yours very truly,

GA-ALA. ROAD CONSTRUCTION CO. INC.

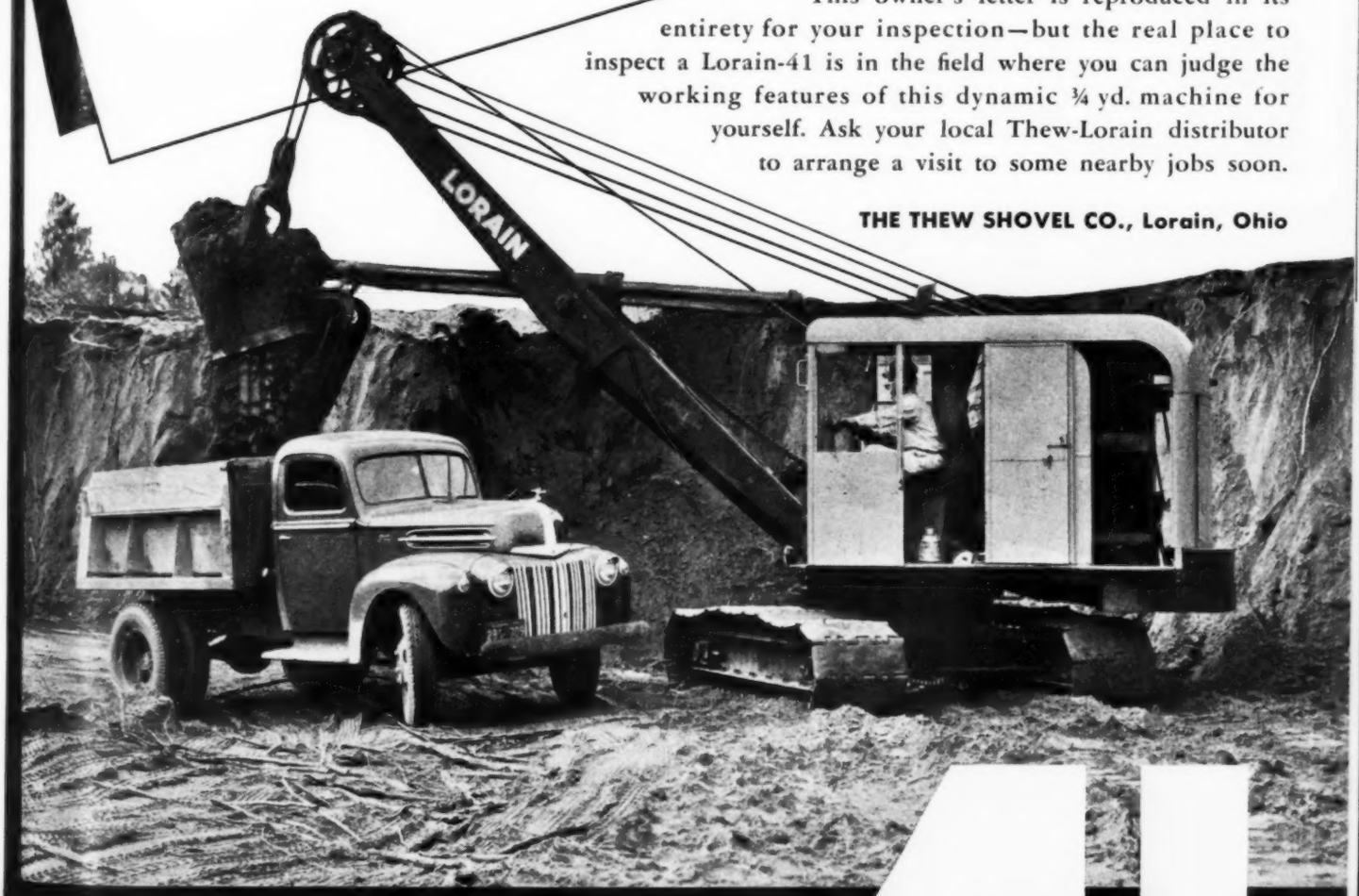
BY: J. V. Gwin Pres.

¾ YD. LORAIN-41 HANDLES 2830 YDS. IN *11 hours*

● A one-day record, sure—but take a look at the record for handling 50,000 yds. An average of 2500 yds. per day over a 20-day period! For a ¾ yd. machine, that's really dishin' dirt in any kind of digging.

This owner's letter is reproduced in its entirety for your inspection—but the real place to inspect a Lorain-41 is in the field where you can judge the working features of this dynamic ¾ yd. machine for yourself. Ask your local Thew-Lorain distributor to arrange a visit to some nearby jobs soon.

THE THEW SHOVEL CO., Lorain, Ohio



Thew
Lorain® **41**

LIFTING CAPACITY UP 50%

When You Mount KOEHRING ON RUBBER

High lifting capacity of the Koehring 304 goes up to 40,000 lbs., is increased by 8½ tons over crawler mounted capacity, when the 304 is mounted on the Koehring Truck Crane Chassis. Lifting Capacity of the Koehring 205 Truck Crane is up proportionately, to 20,000 lbs. Koehring 304 Cruiser Crane (one-man operated, rubber mounted) lifts 29,000 honest pounds. Koehring 205 Cruiser lifts 14,500 lbs.

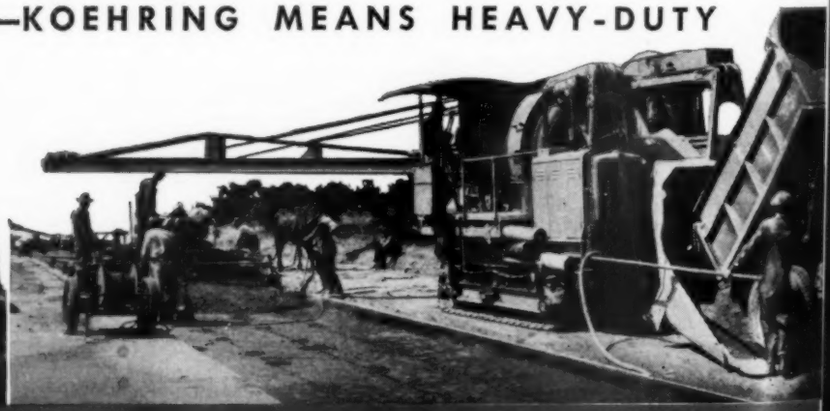
Safely stepping up lifting capacities as much as 50% over crawler capacities is possible only because every Koehring base machine is designed with more than ample reserve strength. Big safety factors enable you to turn every bit of extra stability gained in rubber mounting into extra profit-making lifting capacity.

One-man operation saves labor cost as this Koehring 304 Cruiser Crane handles demolition to make room for new construction.

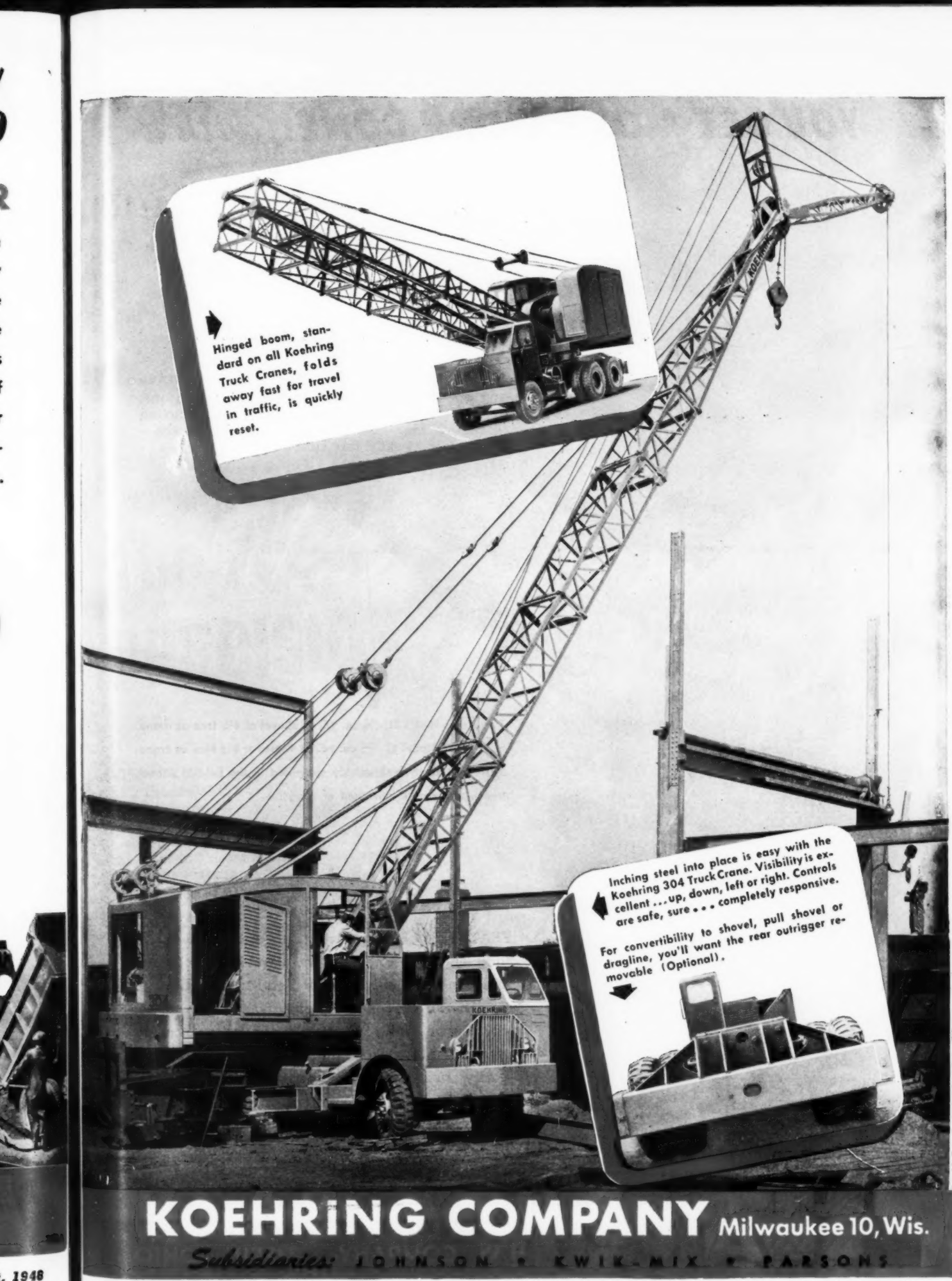
KOEHRING HEAVY DUTY

HAULING OR PAVING—KOEHRING MEANS HEAVY-DUTY

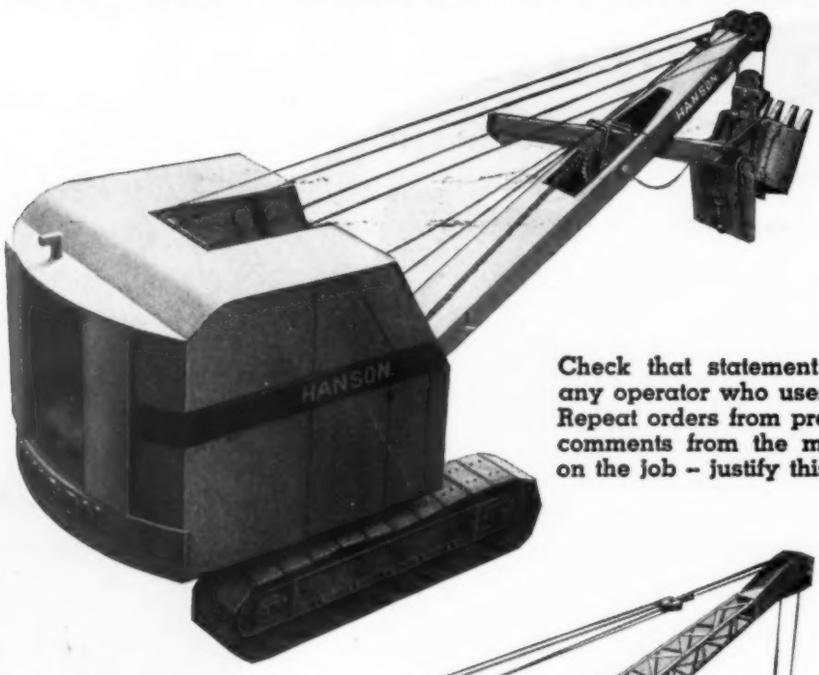
Koehring Dumptor, built by a shovel manufacturer for work with shovels, dumps in 1 second, never turns on shuttle hauls.



Koehring 34-E Twinbatch Paver, long the reliable Heavy-Duty leader in its field, gets highway jobs through on schedule, in the money.

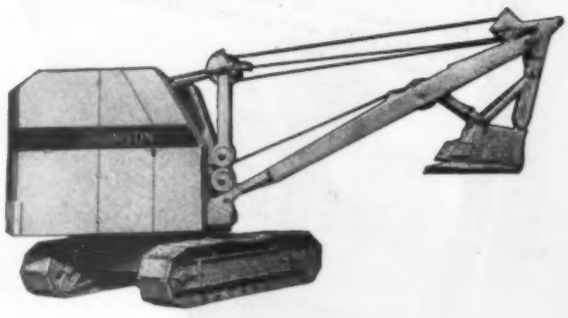

Hinged boom, standard on all Koehring Truck Cranes, folds away fast for travel in traffic, is quickly reset.
Inching steel into place is easy with the Koehring 304 Truck Crane. Visibility is excellent . . . up, down, left or right. Controls are safe, sure . . . completely responsive.
For convertibility to shovel, pull shovel or dragline, you'll want the rear outrigger removable (Optional).
KOEHRING COMPANY Milwaukee 10, Wis.
Subsidiaries: JOHNSON • KWIK-MIX • PARSONS

YOU GET MORE WORK DONE.. with a HANSON



Check that statement against the record. Ask any operator who uses one of the new Hansons. Repeat orders from present users and unsolicited comments from the men who pull the levers – on the job – justify this claim.

Two sizes: Model 31 - ⅜ cu. yd. as shovel or 4½ tons as crane.
Model 41 - ½ cu. yd. as shovel or 6½ tons as crane.
Basic unit easily and quickly converted in the field to shovel, trench-hoe, crane, clamshell or drag-line.



FEATURES: Full revolving . . . chain crowd . . . fully enclosed steel cab . . . welded steel construction . . . ball or roller bearings at all vital points . . . air controlled steering . . . disc type clutches on swing . . . internal expansion, booster type clutches on hoist and crowd . . . all clutches easily and quickly relined without removing shaft assemblies . . . extra long crawlers . . . heavy duty industrial type motor . . . gasoline or diesel.

Write for detailed specifications, catalog RS-248

HANSON CLUTCH AND MACHINERY COMPANY TIFFIN, OHIO

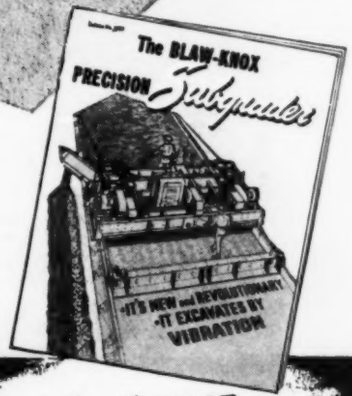
VIBRATION DOES THE DIGGING

The New BLAW-KNOX PRECISION Subgrader

VIBRATION — applied to horizontal cutting blades at 2000 VPM — is the revolutionary principle of subgrade excavation employed by the new PRECISION SUBGRADER . . . the latest BLAW-KNOX contribution to the mechanization of concrete paving construction.

We've been job-proving this machine for two years . . . and it has done a masterful job of cutting its way through all kinds of material . . . always leaving a **precision** subgrade, ready for concreting.

THE BLAW-KNOX PRECISION SUBGRADER is ready for you now. It is one-man operated and easily handles subgrade preparation for maximum paving mixer production.



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CONSTRUCTION EQUIPMENT

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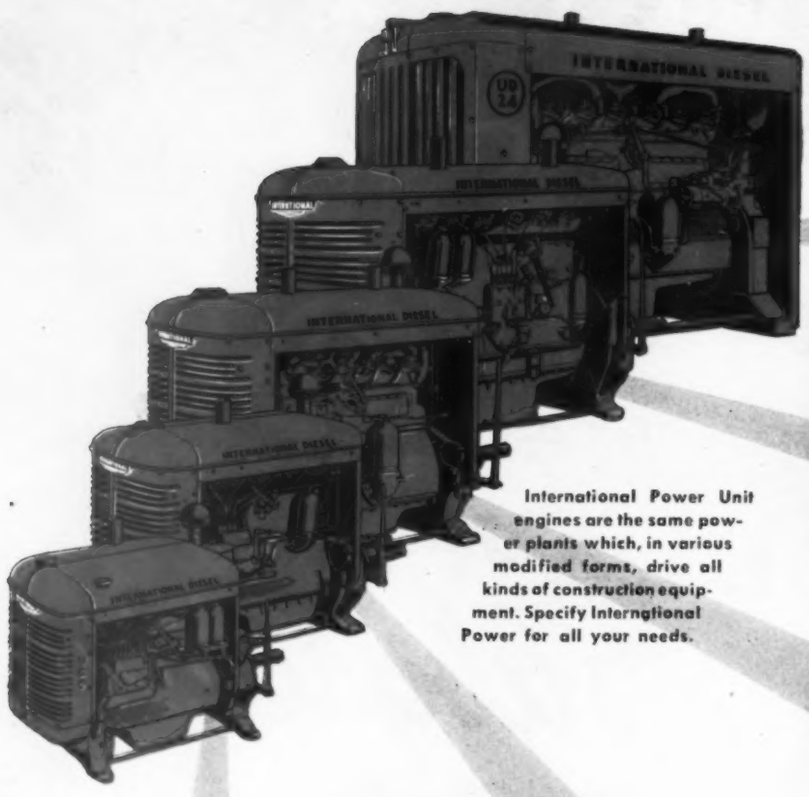
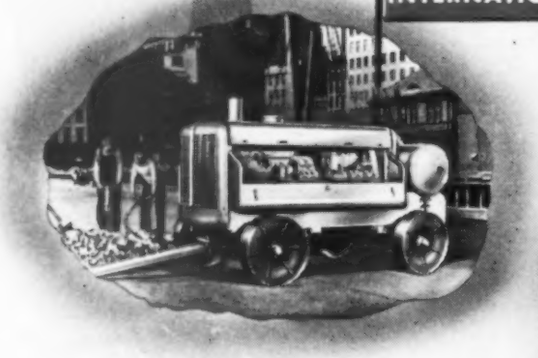
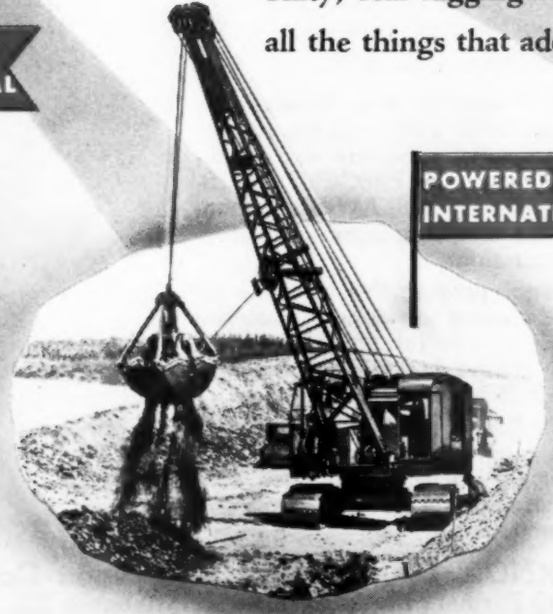


International Power Unit engines are the same power plants which, in various modified forms, drive all kinds of construction equipment. Specify International Power for all your needs.

Whatever your construction equipment needs may be—your best equipment buys are the makes with International Power! In tractors, motor graders, high-speed self-propelled scrapers, shovels, air compressors—in whatever you need for a complete "spread"—you can get the same dependable, low-cost International Power.

It pays to standardize on International Power to get matchless operating economy, rugged durability, real lugging horsepower—all the things that add up to peak





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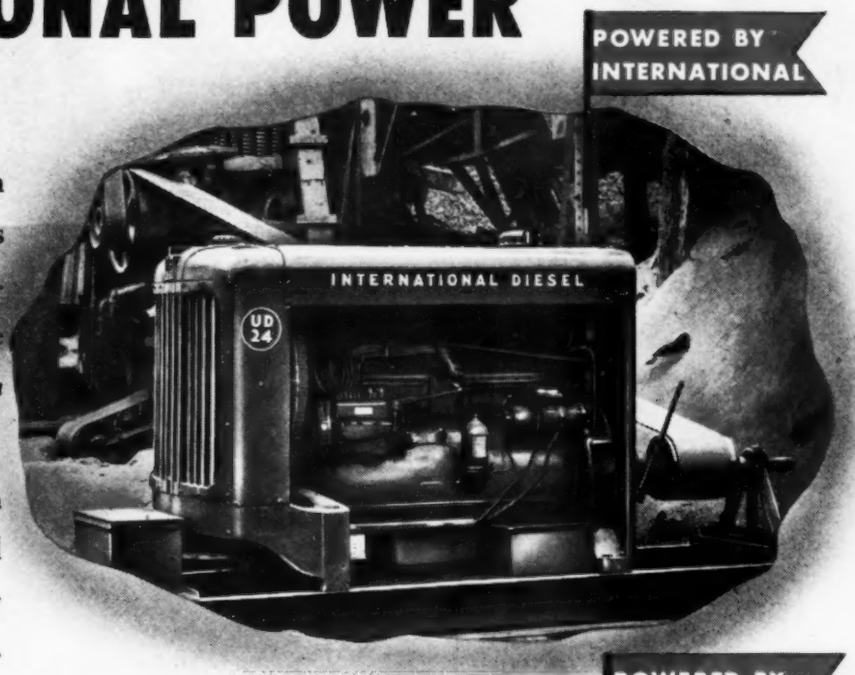
POWER UNITS
DIESEL ENGINES
WHEEL TRACTORS

INTERNATIONAL

PAY DIRT...
INTERNATIONAL POWER



performance. And the "plus" in the International Power picture is superb service and interchangeability of parts. These facts prove *it's good business to standardize on International Power.*

Dig those extra dividends from all your jobs. Let your International Industrial Power Distributor show you how standardizing on International Power will make your "spreads" produce more profits.

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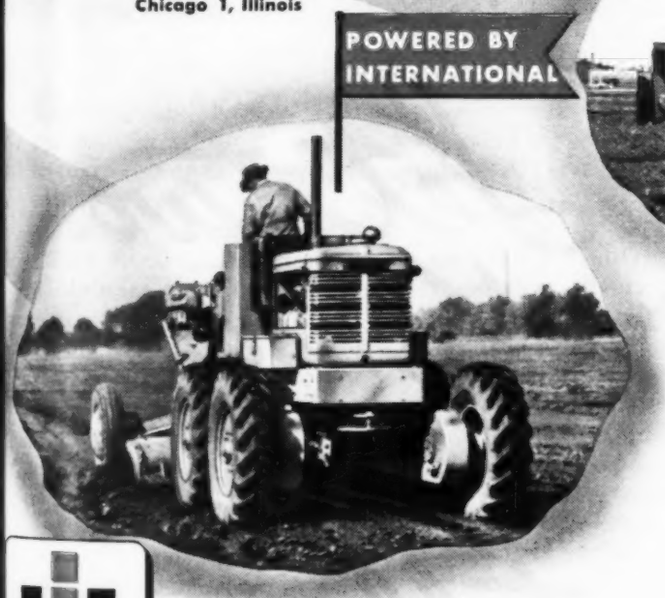
INTERNATIONAL HARVESTER COMPANY
Chicago 1, Illinois



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INTERNATIONAL HARVESTER

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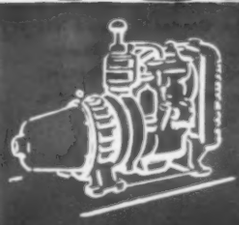


"Our opinion is based on 10 years' experience with 'Caterpillar' Diesel products. We think they're the best made for road-building and maintenance. We especially like the added power in the new, 130-hp. D8 tractor."

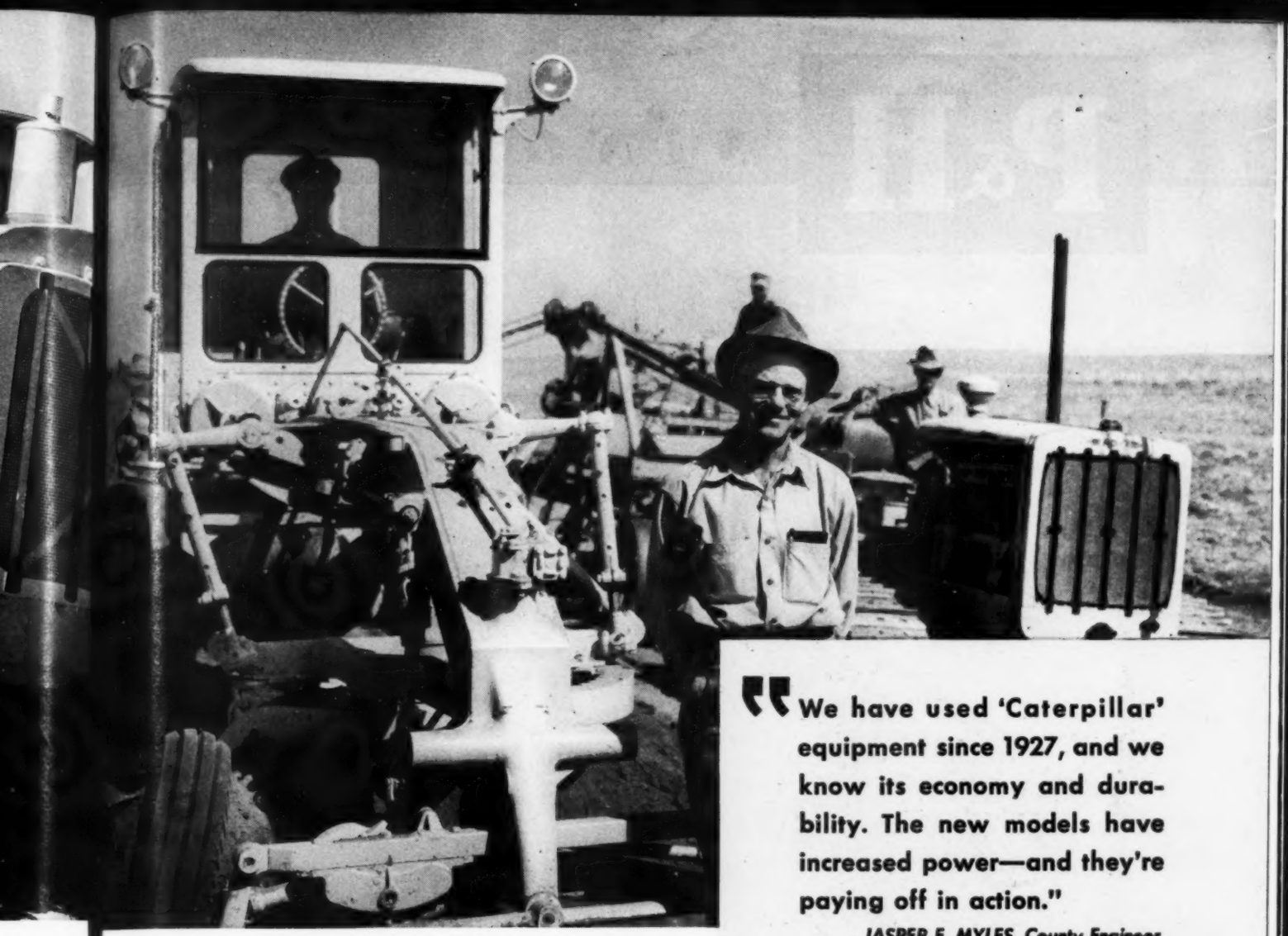
MIKE DINKEL, County Engineer,
Greeley County, Kansas

Let two Kansas counties tell it...

This "Caterpillar" Diesel No. 12 Motor Grader is shown following up a "Caterpillar" D8 Tractor, with Elevating Grader, in a Greeley County, Kansas, road-building assignment. Greeley County also owns three other Motor Graders and a D7 Tractor—all "Caterpillar."

CATERPILLAR D

REG. U. S. PAT. OFF.



"We have used 'Caterpillar' equipment since 1927, and we know its economy and durability. The new models have increased power—and they're paying off in action."

JASPER E. MYLES, County Engineer,
Kearny County, Kansas

Greeley and Kearny Counties lie in the heart of the Kansas wheat and cattle country. There, farm-to-market roads stretch smooth and straight, mile after mile.

In carrying out their successful programs, both Greeley and Kearny Counties have used "Caterpillar" equipment over long periods – Greeley for 10 years, Kearny for 20 – time enough to study long-run performance close up. And both County Engineers hand top honors to "Caterpillar" for steady, long-lived operation.

Today, throughout the road-building field, more and more outfits are using "Caterpillar" Diesels. These powerful, always dependable units are built to lick the tough jobs day in, day out – at lowest operating costs. Back of every "Caterpillar" product stands dealer service which has earned the reputation of "best in the business."

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

This "Caterpillar" Diesel No. 212 Motor Grader is shown finishing a job in Kearny County, Kansas. The unit operates at a fuel cost of 22c per hour, makes 10 one-mile rounds in 10 hours, traveling in second gear. Kearny County also owns four other "Caterpillar" Motor Graders, a D7 and D4 Tractor.

DIESEL

ENGINES • TRACTORS
MOTOR GRADERS
EARTHMOVING EQUIPMENT

P&H SINGLE PASS

One machine

PROCESSES *8,000 sq. yds. daily*

ON TEXAS PROJECT!

On this soil-bituminous state highway in Texas, a P&H Stabilizer with one operator processed on an average 8,000 square yards per day in a single pass.

This highway, over 7½ miles long, and 20 feet wide, was processed to a depth of 6 inches. Maximum production often reached 1,200 square yards per hour!

There's little that's unusual in the speed of this Texas job. Such reports are being received from all over the country — where P&H Single Pass Soil Stabilizers are at work building excellent, all-weather surfaces more quickly.

Making maximum use of in-place materials, the P&H Stabilizer performs with accurately predetermined results, *all 8* basic requirements of soil stabilization — and does it with any type admixture and at a rapid pace. Full information mailed on request.

SOIL STABILIZERS

These are the facts about the job!

Location of Project — State highway 274, Henderson County — from Tool to Kaufman County line.

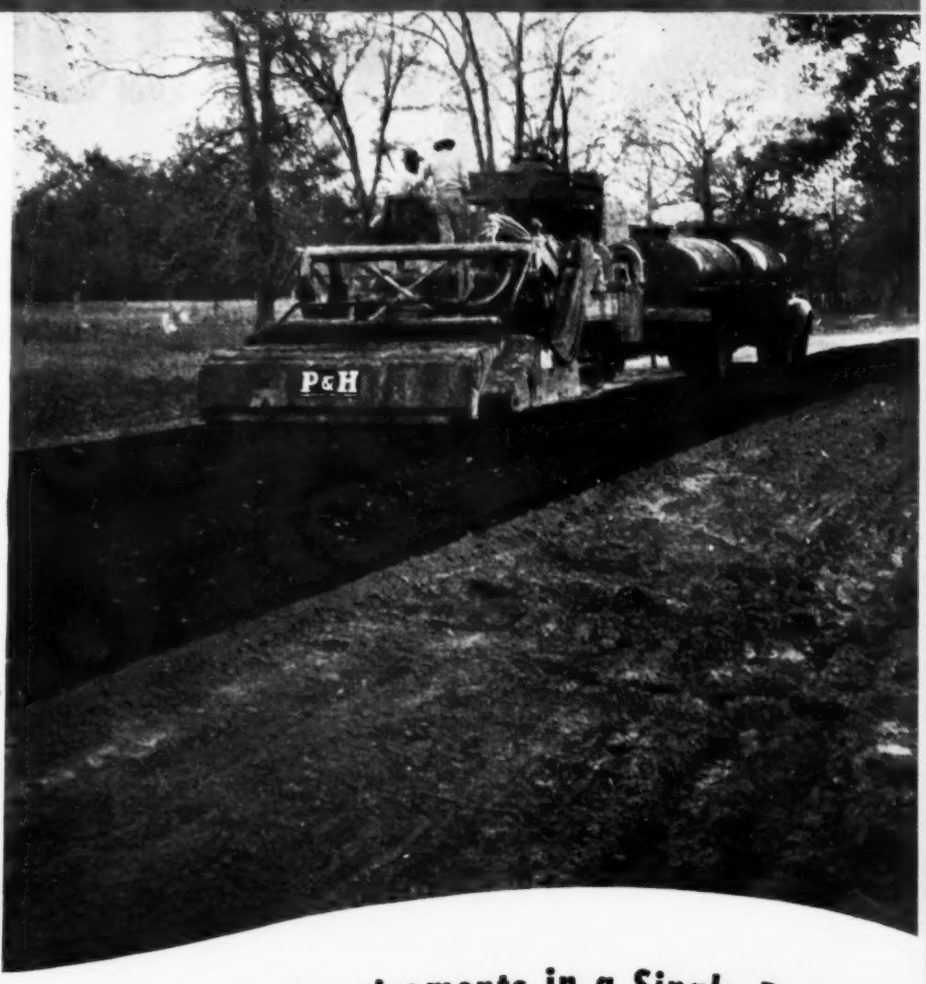
Length of Project — 7.68 miles.

Width of Roadway — 20 feet (2 lanes of 10 feet each).

Type of Soil — Loamy sand.

Stabilizing Agent — 4 gal. cracked fuel oil per sq. yd.

Rate of Production — Average 8,000 sq. yds. per working day.



The P&H Stabilizer Performs These 8 Basic Requirements in a Single Pass!

The report from Texas proves again its ability to fulfill these 8 basic requirements of soil stabilization with definitely predetermined results.

1. Control processing depth for accurate proportioning.
2. Pulverize the soil thoroughly.
3. Blend materials uniformly.
4. Create a true sub-grade.
5. Disperse the liquid through the entire volume in measured quantity.
6. Mix the coated material uniformly.
7. Lay the completely processed material in a fluffy, even depth, ready for compaction.
8. Do all these things in one pass — at a good rate of speed.

If you are engaged in the construction of secondary highways, streets, base courses, airport runways, etc., it will pay you to investigate the performance of the P&H Single Pass Soil Stabilizer under conditions similar to your own. Ask for the facts.

NEW SOUND MOTION PICTURES!

If you would like to see a P&H Stabilizer at work processing soil-stabilized roads — learn how it does it — write us about the showing of our new full color, sound motion pictures. One covers soil-cement and the other soil-bituminous work.

P&H

SINGLE PASS STABILIZERS

4496 West National Avenue
Milwaukee 14, Wis.

HARNISCHFEGER CORPORATION

EXCAVATORS • ELECTRIC CRANES • ARC WELDERS P&H HOISTS • WELDING ELECTRODES • MOTORS

BIG tools for

30-YD capacity "B" TOURNAPULL

300 H.P. rubber-tired "B" TOURNADOZER

R. G. LeTOURNEAU

LeT

EQUIPMENT

TOURNAPULLS

BIG production

IF PRODUCTION EARTHMOVING is your business, you'll find this powerful new team — B Tournadozer and extra-capacity B Tournapull — the answer to your high-production requirements.

The B Tournapull moves 30 cubic yards every trip, over twice the usual scraper pay-load . . . doubles your dirt-moving output per man hour . . . cuts your operating and maintenance costs practically in half.

To the Big B Tournapull speed, flexibility and extra capacity, add the terrific pushing power of the new 300 h.p. B Tournadozer . . . and you have an earthmoving team that cannot be equaled in the scraper field . . . IN PAY YARDS MOVED. The giant, powerful Tournadozer has the speed and maneuverability to synchronize its full 300 h.p. "push" with the 240 h.p. "pull" of the B Tournapull to get BIGGER loads FASTER . . . 30 cubic yards loaded in less than one minute.

Matched Equipment — This pair of BIG B's is matched right down the line . . . both are built for the rough going of BIG PRODUCTION earthmoving . . . both have constant-mesh, constant-power Tournamatic Transmission with instantaneous gear selection . . . both have labor-saving electric controls . . . and both speed along on BIG 24.00 x 29 tires that are interchangeable from one rig to the other. In addition, these new-type tires have tapered beads that lock tire to rim . . . rayon cord construction to safely carry tremendous loads at extremely low pressures. Result: greater traction and flotation in soft materials . . . fewer weather delays.

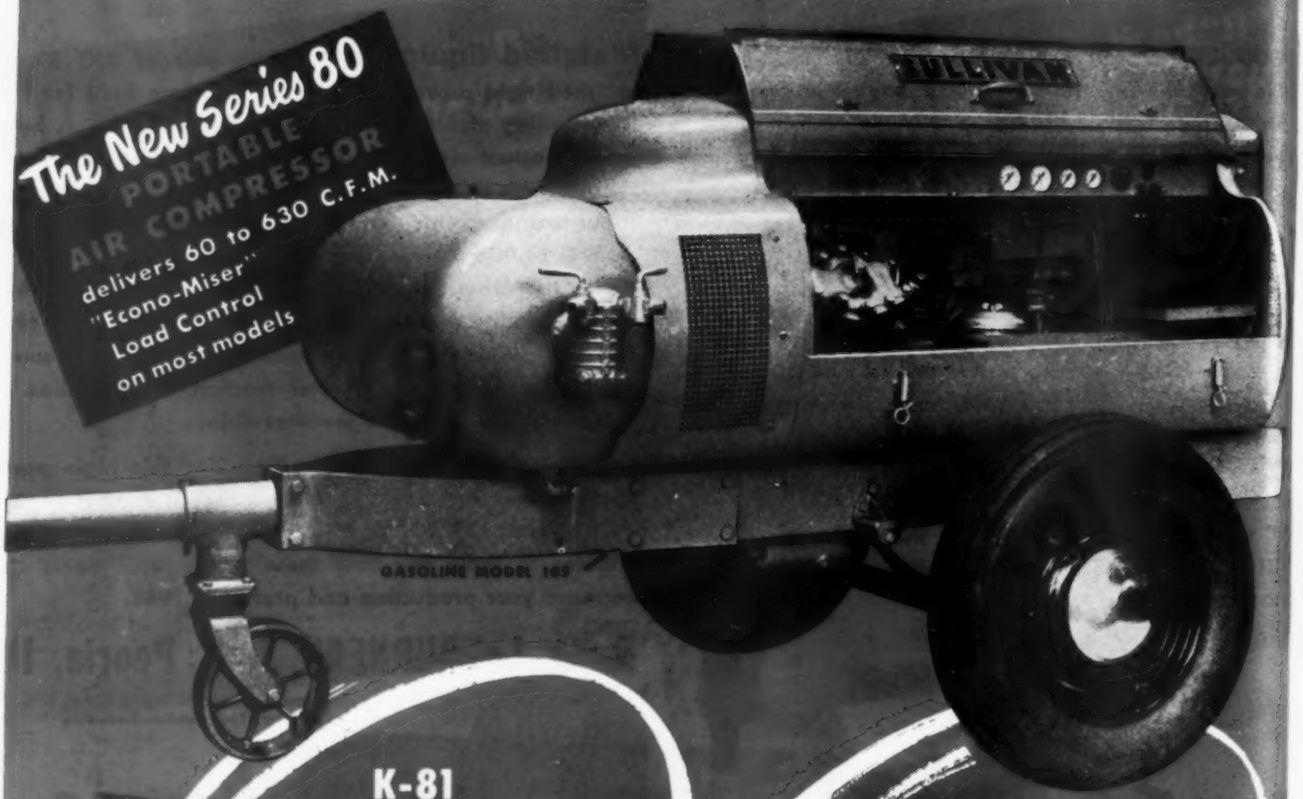
"B" is more than a model number for this high-speed, rubber-tired earthmoving team . . . it's a symbol of BIG TOOLS for BIG PRODUCTION. Ask your LeTourneau Distributor to show you how these "B for BIG" tools can increase your production and profits in 1948.

R. G. LeTOURNEAU, Inc., Peoria, Ill.

Tournapull—Trademark Reg. U.S. Pat. Off. C88
Tournadozer, Tournamatic—Trademark

TOURNADOZERS

Cash in on The Extra Air Power of JOY COMPRESSORS and AIR TOOLS



K-81
PAVING BREAKER

SILVER STREAK

CADMIUM PLATED
FOR
GREATER IMPACT
FASTER DRILLING
LONGER LIFE
NO RUSTING
NO SCORING

JOY LIGHT WEIGHT
WAGON DRILL

GETS 50 TO 80% MORE FOOTAGE THAN SAME-SIZE HAND-HELD DRILL

Write for Bulletins giving full details

Consult a Joy Engineer

SULLIVAN DIVISION

JOY MANUFACTURING CO.

GENERAL OFFICES: HENRY W. OLIVER BUILDING • PITTSBURGH, PA.

● Remember, the MultiFoote Elevating Boom has been proved in service as has no other paver boom of this type. MultiFoote Pavers with Elevating Booms handled the pouring of ammunition storage igloos during the war.

With the MultiFoote Elevating Boom you are equipped for maximum versatility. You can handle the ordinary problems of pouring slab and without making any changes handle the problems imposed by abutment work or retaining wall. In addition you are equipped to feed Pumpcrete equipment and bid on building foundation work and piers.

Add to this the MultiFoote Crawlers with their self-cleaning action, the high operating platform, the no-pressure water system, the double cone drum, the rotary power discharge, MultiFoote simplicity and other features that mean easy upkeep and high output and you'll specify a MultiFoote too. We'll be glad to tell you all about it.

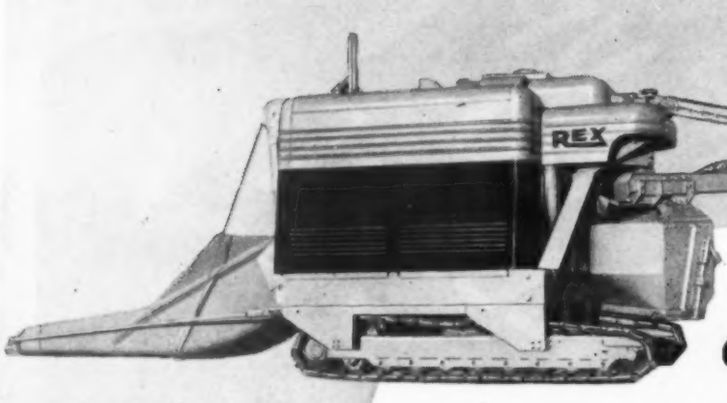
Ask about the Adnun Black Top Paver, the only paver of its kind that can lay black top, stone and cinders.

THE FOOTE COMPANY, INC.
1936 State Street • Nunda, N. Y.
Subsidiary of BLAW-KNOX CO.

FOOTE

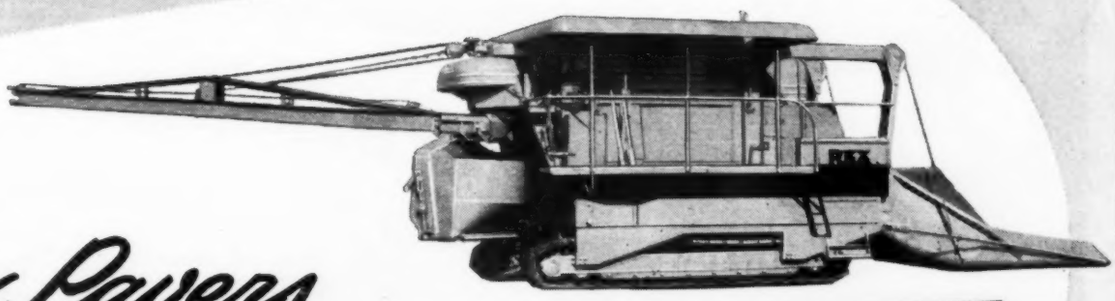
MULTIFOOTE CONCRETE PAVERS
ADNUN BLACK TOP PAVERS
Kinetic ASPHALT MIXERS

REX 34E SINGLE DRUM PAVER . . . ENGINE SIDE



only the New

REX 34E DOUBLE DRUM PAVER . . . OPERATOR'S SIDE



Rex Pavers

give you HYDROCYCLE CONTROL

REX HYDROCYCLE CONTROL is a profit advantage you can't afford to miss. It gives you a faster over-all batch cycle for most yardage placed on the sub-grade. It cuts down operator fatigue . . . enables him to keep the paver going at top speed all day long. It's foolproof . . . eliminates the human element. It assures exact timing of batch cycle and mixing time . . . eliminates those costly wasted seconds that add up to so much lost yardage and lost profit.

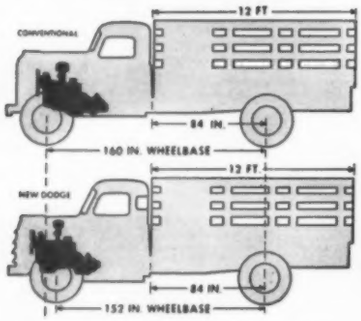
REX HYDROCYCLE CONTROL combines the batchmeter and automatic cycle operation in one unit. All the operator has to do is set the batchmeter, give the levers a gentle palm push and Hydrocycle takes over . . . operates the charging, batch transfer, discharging and water control. The operator never has to leave his comfortable seat. And at any time, the operator can cut into the cycle and take over operation by hand.

REX HYDROCYCLE CONTROL eliminates many drives, gear cases, rods, levers, bell cranks, etc. All control units can be placed right in front of the operator. The whole paver is more accessible for easiest maintenance.

WHY NOT have your Rex Distributor show you how Hydrocycle and the many other new advantages of the new Rex Pavers add up to greater yardage production . . . most profit for you. Or if you prefer, write us direct. Chain Belt Company, 1685 West Bruce Street, Milwaukee 4, Wis.

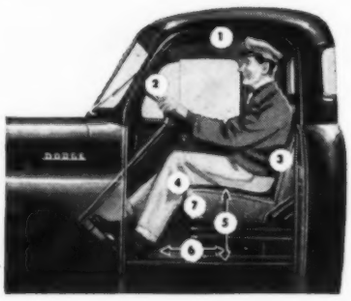
CONSTRUCTION MACHINERY

Only Dodge gives you all these features



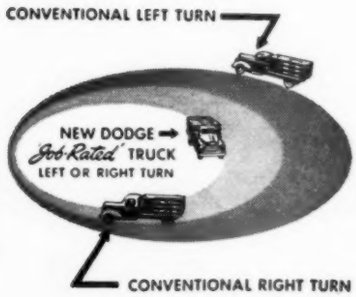
BETTER WEIGHT DISTRIBUTION

By moving the front axle back, and the engine forward, more load is carried on the front axle, giving Dodge "*Job-Rated*" trucks *much* better weight distribution, plus ability to haul *more payload.*



MORE COMFORT AND SAFETY

1. Plenty of headroom. **2.** Steering wheel right in the driver's lap. **3.** Natural, adjustable back support. **4.** Proper leg support. **5.** Chair-height seats. **6.** 7-inch seat adjustment. **7.** "Air-O-Ride" cushions, adjustable to weight of driver and road conditions.



SHORTER TURNING DIAMETERS

You can turn in much smaller circles, right and left, because Dodge "*Job-Rated*" trucks have an ingenious new type of "cross-steering," plus shorter wheelbases and wider tread front axles.

WITH THE TRUCK THAT'S "Job-Rated" TO FIT YOUR JOB!

A truck that *fits your job* saves money . . . and lasts longer. It's easy to see *why.*

If your truck is too *big,* you waste gas and oil carrying unnecessary weight. If it's too *small,* breakdowns run up excessive maintenance costs.

There's no need to drive expensive "misfits." Go to your nearest Dodge dealer. Tell him *what* you haul, *how much* it weighs, and *where* you haul it. He will then recommend a Dodge "*Job-Rated*" truck specifically engineered and built . . . to fit *your* job.

Such a truck will have "*Job-Rated*" power . . . the *right* one of seven great *truck* engines.

It will have exactly the *right* clutch, transmission, rear axle . . . and every other unit . . . to haul *your* loads over *your* roads.

In all, there are 248 basic "*Job-Rated*" chassis and body models. They are engineered and built for gross vehicle weights up to 23,000 pounds, and for gross tractor-trailer weights up to 40,000 pounds. Each is "*Job-Rated*" for maximum economy, typical Dodge dependability.

And remember . . .
ONLY DODGE BUILDS "*Job-Rated*" TRUCKS

DODGE "Job-Rated" TRUCKS

FIT THE JOB . . . SAVE MONEY . . . LAST LONGER

from thin Sections and HARD-TO-GET-AT PLACES

TO DAMS AND OTHER MASS CONSTRUCTION

JACKSON
CONCRETE VIBRATORS

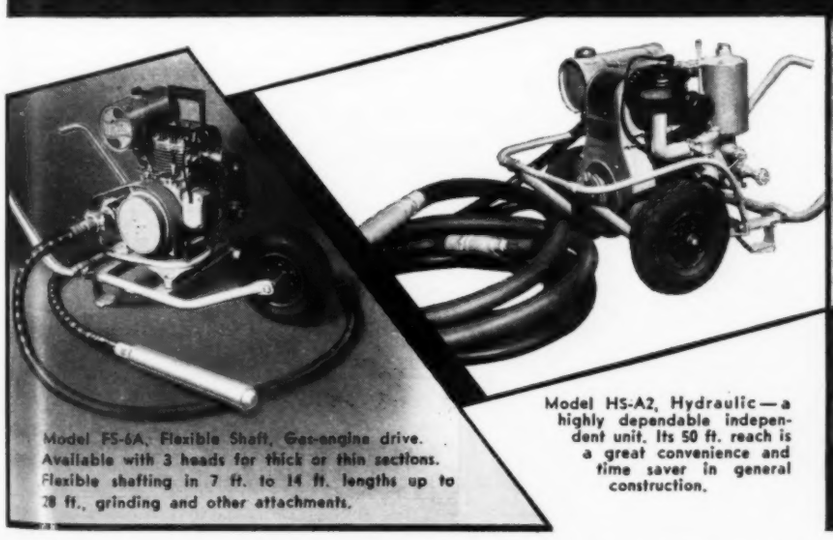
Model FS-7A Flexible Shaft, Electric. Excellent for thin sections. Exceptionally powerful for its small size. Available with 24", 36", 7' or 14' shafts—1¾" x 17" and 2" x 10" heads, grinding attachment.

Model VS-4 — virtually a "must" on mass concrete construction. This vibrator has a tremendously impressive record on nearly all of the Nation's large dam projects.

are available in models ideally suited to each and every concrete construction requirement. Products of more than 25 years of experience and actual service, they provide the maximum of efficiency and reliability. Write for recommendation and complete information on the vibrator that will handle your particular job to best advantage.

The complete line, of which just a few representative models are shown here, includes electric and gas-engine driven flexible-shaft and hydraulic vibrators for general construction, light construction, mass concrete, street and highway paving, floors, form vibrating, product manufacture and other uses.

ELECTRIC TAMPER & EQUIPMENT CO., Ludington, Mich.



Model FS-6A, Flexible Shaft, Gas-engine drive. Available with 3 heads for thick or thin sections. Flexible shafting in 7 ft. to 14 ft. lengths up to 28 ft., grinding and other attachments.

Model HS-A2, Hydraulic — a highly dependable independent unit. Its 50 ft. reach is a great convenience and time saver in general construction.

"We save time with

Gulf Quality Products

and keep our maintenance costs low"

says Superintendent
L. D. Brinson

Rubin Construction Co., West Palm Beach, Fla., has the contract to resurface 4 miles of U. S. Highway #1 in Palm Beach County, Fla. Gulf Quality products which are helping this contractor get fine performance from equipment include Good Gulf Gasoline, Dieselect Fuel Oil, Gulfpride Motor Oil, Gulflube H. D. Motor Oil, Gulflex Chassis Lubricants, and Gulflex Wheel Bearing Grease.

"WE figure we save a lot of time and money by using Gulf lubricants and fuels," says Superintendent L. D. Brinson of Rubin Construction Co. "We get the kind of lubrication and fuel performance that keeps our equipment on the job and operating smoothly—that helps us steer clear of excessive wear and breakdowns."

The use of quality petroleum products is one of the surest guarantees of efficient job operation and lower maintenance costs for equipment—which add up to greater profits! That's why so many leading contractors engaged in all types of construction work specify Gulf lubricants and motor fuels. They deliver an extra margin of performance!

Gulf Oil Corporation · Gulf Refining Company

Division Sales Offices:

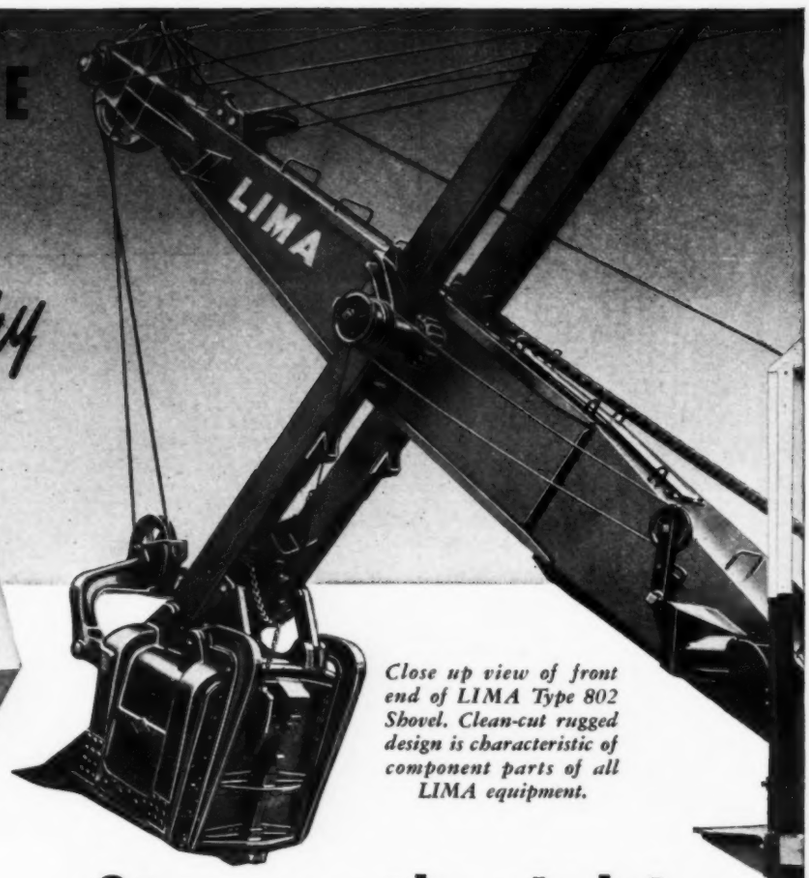
Boston · New York · Philadelphia · Pittsburgh · Atlanta
New Orleans · Houston · Louisville · Toledo

GULF

A LOOK AT THE FRONT END

shows another reason why

LIMA



Close up view of front end of LIMA Type 802 Shovel. Clean-cut rugged design is characteristic of component parts of all LIMA equipment.

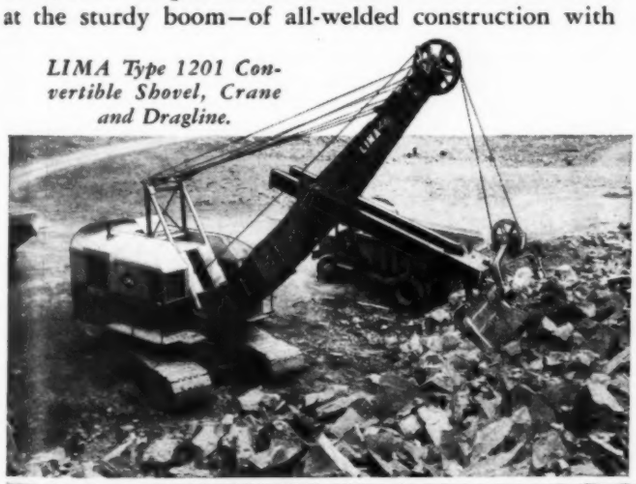
SHOVELS . . . Stay on the Job!

"LIMAS GIVE THE LEAST TROUBLE OF ANY MACHINES WE HAVE"

THIS STATEMENT from a customer is typical. LIMA excavating equipment has that extra "built-in" stamina which means increased production and minimum "down-time"

Take, for example, the Front End of the Shovel. Look at the sturdy boom—of all-welded construction with inside reinforcements for extra strength. Shipper shaft is splined for permanent alignment with crowd chain sprocket and pinions. Location—not on top, but near center line of boom gives better support, and at extended position allows direct pull, minimizing strain on cable, racking, shaft, and boom, also allowing higher lift and increased working range.

LIMA Type 1201 Convertible Shovel, Crane and Dragline.



The smooth machined throat of the large diameter sheave is a machined groove—accurately centered to shaft—with no high spots to wear cables. Independent chain crowd permits shaking of dipper. Spring bumper blocks take shock of dipper door and wood bumper blocks absorb shock of dipper at base of boom. Every component is designed for highest output with minimum maintenance.

Lima shovels range from ¾ to 6 yard capacities, cranes from 13 to 100 tons. Write for descriptive bulletins.

Lima Shovel and Crane Division

LIMA, OHIO

OTHER DIVISIONS: *Lima Locomotive Works Division; Niles Tool Works Co.; Hooven, Owens, Rentschler Co.*

LIMA HAMILTON CORPORATION

New Developments
have made it most advantageous for all wire rope users to specify only
Preformed Wire Rope
Ask your manufacturer or distributor to tell you how long Preformed lasts, how easy it handles, how little more it costs, and how much you save by using it now.
Say Preformed next time you order wire rope for any purpose.

TRUSCON WELDED STEEL FABRIC

Equalizes Load Stress and Helps Maintain High Road Efficiency

Structural Action at Crack in Plain, Non-Reinforced Pavement.

As wheel load approaches crack in plain pavement, loaded slab end carries entire load with no assistance from non-loaded slab.

Structural Action at Crack in Truscon Welded Steel Fabric-Reinforced Pavement.

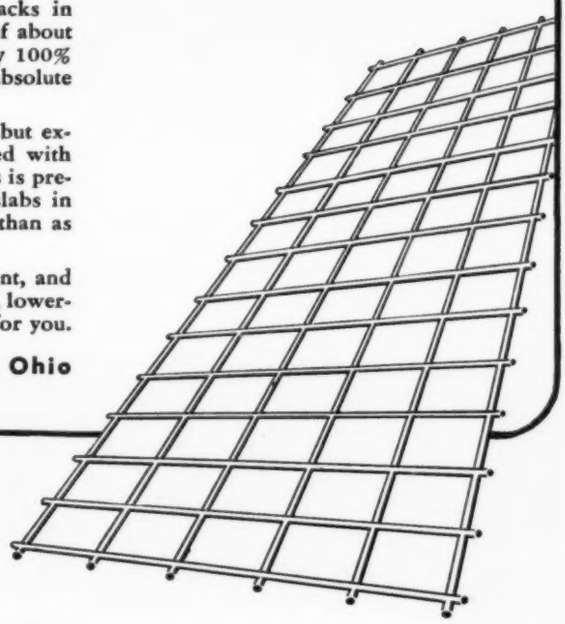
As wheel load approaches closed crack in reinforced pavement, aggregate interlock renders the crack-joint shear resistant, and both slab ends, instead of one, carry the load.

AUTHORITATIVE and official loading tests prove that cracks in reinforced pavements consistently average a load transfer of about 48% at all seasons of the year. This value represents practically 100% shear-resisting capacity, since a load transfer of 50% is the absolute maximum that could theoretically occur under any conditions.

Cracking in concrete pavements cannot be eliminated entirely, but experience has proved that when the pavement slab is reinforced with Welded Steel Fabric between joints, the formation of wide cracks is prevented. The reinforcing holds the aggregate of the fractured slabs in close contact and enables the slab to function as a unit rather than as individual parts.

You can be *sure* that Truscon Welded Steel Fabric Reinforcement, and associated Truscon steel roadbuilding products, will build better, lower-cost roads for the communities you serve, and greater prestige for you.

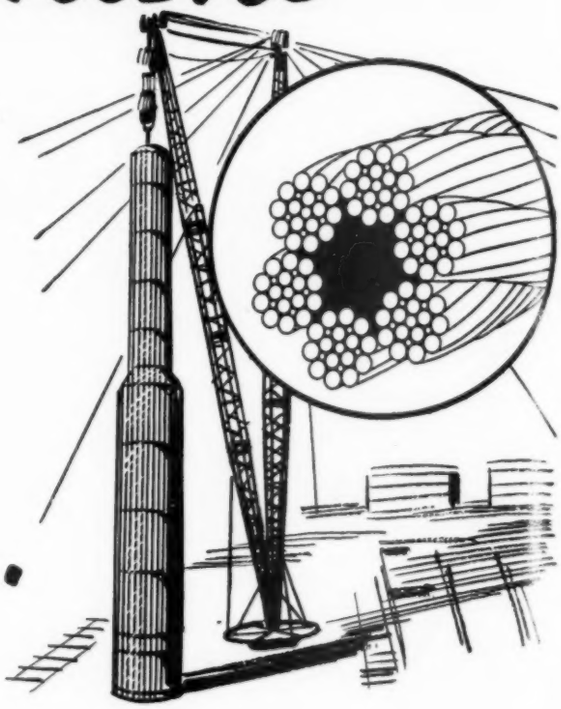
TRUSCON STEEL COMPANY • Youngstown 1, Ohio
Subsidiary of Republic Steel Corporation

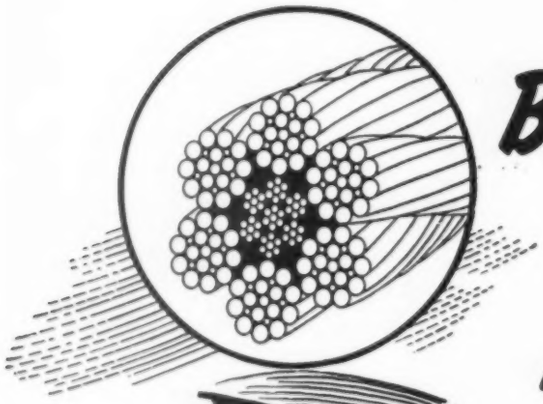


TRUSCON
Reg. U. S. Pat. Office
WELDED STEEL MESH
Covers the Continent

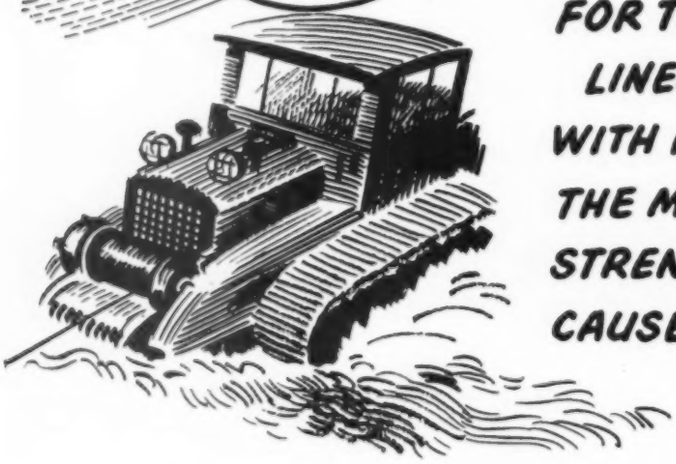
SOME ROPES FOOL YOU

U-W 6×19 FILLER WIRE CABLE WITH HEMP CENTER IS OK FOR TACKLE BLOCK FALLS BECAUSE IT IS SUFFICIENTLY FLEXIBLE AND FATIGUE RESISTANT





BUT...



FOR TRUCK AND TRACTOR WINCH LINES U-W 6×19 FILLER WIRE WITH I.W.R.C. IS BETTER BECAUSE THE METALLIC CENTER ADDS MORE STRENGTH AND RESISTS CRUSHING CAUSED BY DRUM CROSS WINDING

For longest and best service, always specify
U-W LAYRITE (*Preformed*) IMPROVED PLOW STEEL

UPSON-WALTON IS THE ONLY MANUFACTURER OF ALL 4•••
Wire Rope, Tackle Blocks, Wire Rope Fittings, Brattice Cloth.
We invite you to let us engineer your problem jobs.

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THE UPSON-WALTON COMPANY

Manufacturers of Wire Rope, Wire Rope Fittings, Tackle Blocks, Brattice Cloth

Main Offices and Factory: Cleveland 13, Ohio

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New Ingersoll-Rand QUARRYMASTER

Gets Positive Drill Feed with Whitney Roller Chain

The new self-propelled Ingersoll-Rand Quarrymaster, designed for strip, open pit mining, heavy construction and quarry work, drills holes up to 6 inches in diameter and up to 100 feet in depth. The fast drilling piston type rock drill strikes more than 200 blows per minute. Drill feed is accomplished by an air driven feed motor and chain controlled by a conveniently located throttle.

In this accurate self-controlled drill feed, Ingersoll-Rand employs a Whitney Roller chain in the feed mechanism. The positive chain feed is particularly valuable in drilling through slips and seams where a fine degree of regulation is essential. In addition to transmitting full power, the rugged construction of Whitney Roller chain assures long operating life and cuts maintenance.

Whether it's for new equipment or replacement, it will pay you to use Whitney chains in your products. Their flexibility will simplify your design problems. Their rugged construction will assure long-lived performance. Write for information.

Whitney Chain & Mfg. Co.

Division of Whitney-Hanson Industries, Inc.

216 HAMILTON STREET, HARTFORD 2, CONN.

SOIL-CEMENT
stands out in the light-traffic field

FROM Maine to California, from Georgia to Washington, the constantly growing yardage of soil-cement paving is firmly establishing it as the low-cost, long-service, light-traffic pavement. Now a coast-to-coast survey of soil-cement roads by state highway departments reaffirms soil-cement's economy and durability.

Returns covered 59 projects in 19 states. Pavements ranged from 2 to 10 years old, averaging almost 6 years. On 32 projects there was no breakage at all and on 21 others it was negligible. A detailed analysis of this comprehensive study, "*Condition Surveys of Soil-Cement Roads,*" is available on request. Write for your free copy. Distributed only in the United States and Canada.

Since the first scientifically controlled pavement was built in 1935 more than 50 million sq. yd. of soil-cement have been placed in the United States and Canada. Practically all of this tremendous yardage is in service today—an outstanding low-cost service record.

Paving with soil-cement is easy and fast. There is no guess work about it; scientific controls are applied both before and during construction. It's economical, too, because about 90 per cent of the required material is native soil already on the site. And published records show that it can be depended on to render long service at low maintenance expense.

1 Highway 3-H near Tekoa, Wash. Built in 1938

2 Soil-cement road near Orange County Airport in California. Built in 1941

3 Mt. Airy Road, route 29 in N. J. Built in 1939

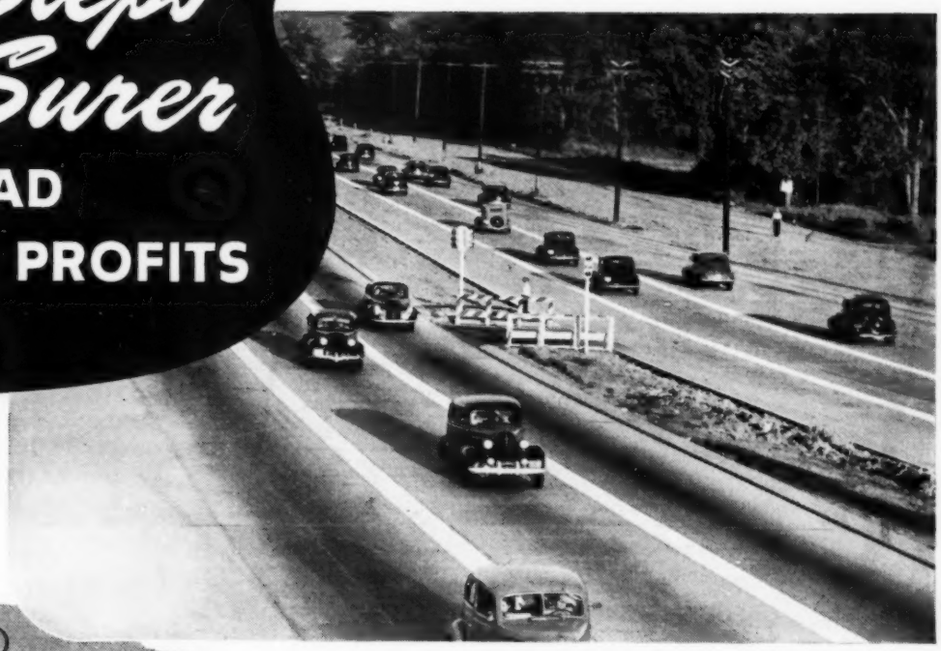
4 Soil-cement road near Athens, in Clark County, Ga. It was built in 1938

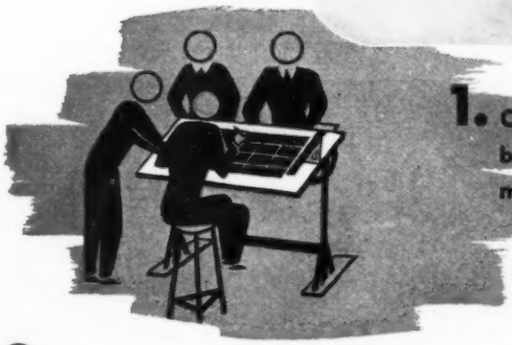
PORTLAND CEMENT ASSOCIATION

DEPT. 8-28 • 33 W. GRAND AVENUE • CHICAGO 10, ILLINOIS

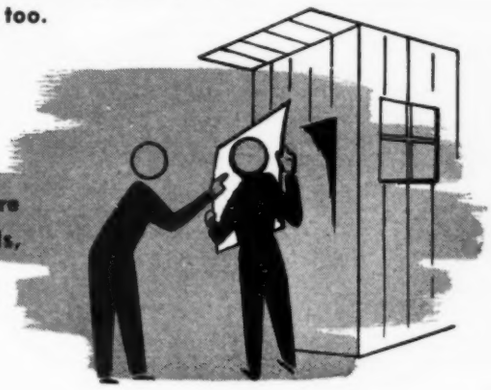
A national organization to improve and extend the uses of portland cement and concrete . . . through scientific research and engineering field work

3 Steps for Surer ROAD BUILDING PROFITS

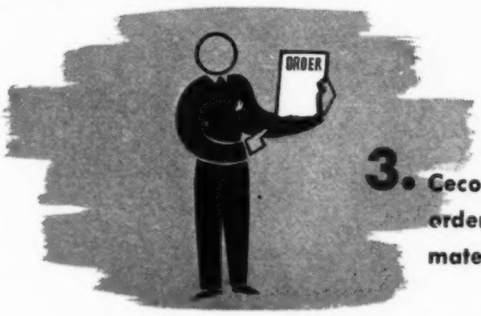




1. Ceco's pre-bidding data takes the guess-work out of bidding, so you can bid to get the job—make money on it, too.



2. Ceco's material data lets you forget detail work—you are supplied with blue prints on reinforcing and other materials, making the job much easier.



3. Ceco streamlines road building for you. In one complete order you can specify everything you need. You get materials when you want them, where you want them.

CECO STEEL PRODUCTS CORPORATION
GENERAL OFFICES: 5701 West 26th Street, Chicago 50, Illinois

CECO STEEL

TYPICAL CECO HIGHWAY PRODUCTS • Welded Wire Fabric • Metal Center Strips
Cecure Curing Compound • Reinforcing Steel • Load Transfer Devices • Joint Sealing Compound
Dowel Bar Supports and Sockets • Stake Pins • Expansion Joints • Sub-Grade Paper

In construction products **CECO ENGINEERING** *makes the big difference*

THE RIGHT STRUCTURE

FOR LOWER DRAINAGE COSTS

Choosing the right structure for the most economical drainage is no problem when you come to ARMCO. Here you can select the *one right type and size* for your needs.

There is plain galvanized ARMCO Corrugated Metal Pipe for normal usage . . . PAVED-INVERT Pipe to check erosion . . . ASBESTOS-BONDED Pipe where severe corrosion is a problem. For larger structures ARMCO MULTI-PLATE Pipe or Arches are prefabricated and delivered to the job site ready for immediate assembly. Where headroom is limited, a standard corrugated PIPE-ARCH or MULTI-PLATE PIPE-ARCH brings real savings. And you can always be sure of efficient, economical end treatment by finishing your standard corrugated Pipe or PIPE-ARCH with an ARMCO End Section.

ARMCO Drainage Structures have been winning new engineer and contractor friends for more than 40 years. They are easy to handle and install. Job costs are low. Long, maintenance-free service is assured.

You'll find ARMCO structures ideal for use on highways, railroads, airports, stream enclosures and wherever else you need efficient, economical drainage. Write for complete information. Armco Drainage & Metal Products, Inc., 4195 Curtis Street, Middletown, Ohio.

ARMCO DRAINAGE STRUCTURES

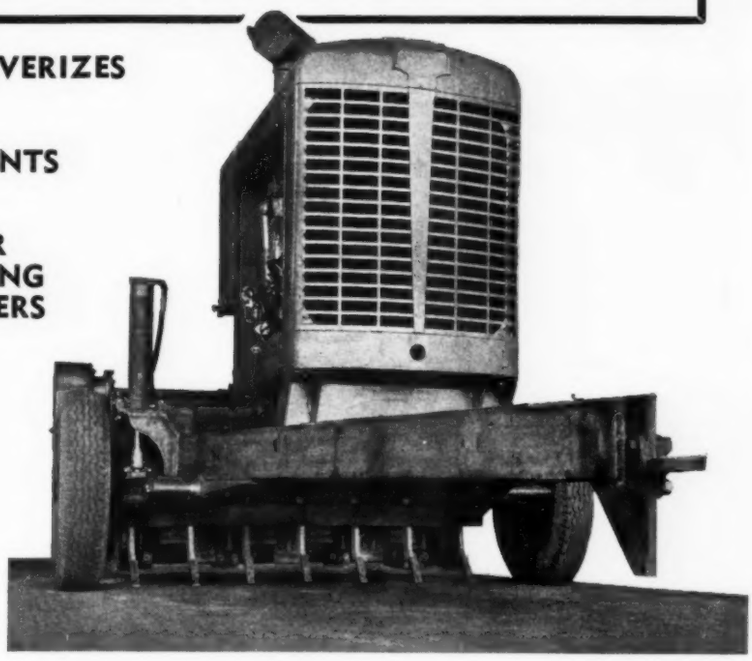
ARMCO

The WOOD PREPARIZER

IT

SCARIFIES AND PULVERIZES OLD OIL MAT, ASPHALT AND MACADAM PAVEMENTS

PREPARES SOILS FOR BLENDING OR MIXING WITH LIQUID BINDERS OR SOIL CEMENTS

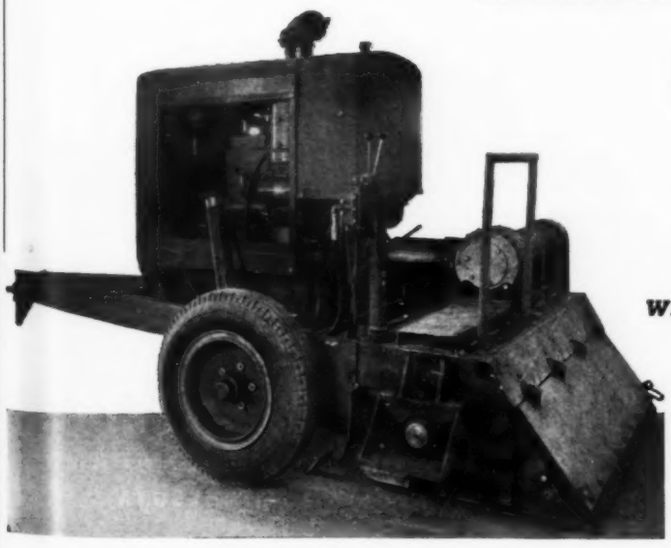


THE WOOD PREPARIZER IS A HEAVY DUTY MACHINE FOR ROADBUILDERS AND MAINTENANCE FORCES.

ENGINEERED AND BUILT TO WITHSTAND LONG AND HARD USAGE. UNEQUALLED PERFORMANCE AND ECONOMY

- THE WOOD PREPARIZER can be used on any pavement that could be scarified with a motor patrol. It will scarify and pulverize in one operation making it possible to reuse aggregate in the old wearing mats in the reconstruction of these roads.
- Mounted on Hydraulic Jacks insuring perfect depth control making it possible to peel off the mat and pulverize it without disturbing the road bed.
- A perfect machine for conditioning all types of soils in base courses or wearing surfaces on all mixed-in-place jobs.

DESIGNED FOR TOWING WITH A CRAWLER TYPE TRACTOR



BUILT BY THE MANUFACTURER OF THE FAMOUS WOOD ROADMIXERS

PRODUCED IN 2 SIZES

Model P-400—4' Width
Model P-600—6' Width

Write for Descriptive Literature and prices

ROADBUILDING EQUIPMENT

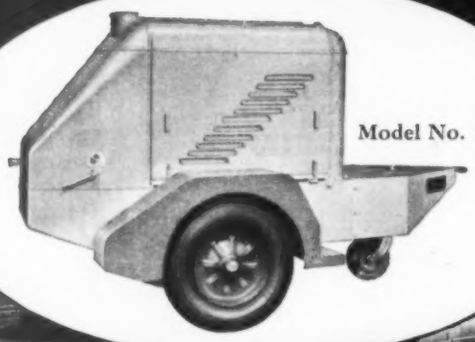
WOOD MANUFACTURING CO.

BOX 620, 6900 TUJUNGA AVENUE • NORTH HOLLYWOOD, CALIFORNIA

THERE'S NO WARM UP TIME NEEDED WITH A

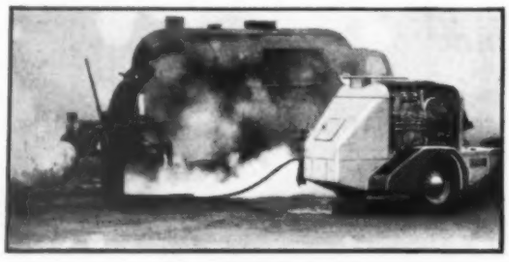
"TANKAR" STEAM HEATER

IT GOES TO WORK INSTANTLY



Model No. 115

Now you can unload a tank car of Asphalt, Tar, Emulsion, etc., in one-third less time than ordinary units. In addition, you can clean equipment, degrease garage floors, heat buildings and a dozen other uses! The Littleford *"Tankar" Steam Heater produces steam up to 200 lbs. pressure from a cold start in 2 minutes time.* Just think of it! Ready to work in 2 minutes time! Where can you find a unit that is such a time and money saver? In addition to speed of operation, the "Tankar" Steam Heater is compact, full automatic, sturdy in construction and fast trailing. A *"Package of Steam" is this unit.* Write for Bulletin No. 21.



MANUFACTURERS OF

"Spray Master" Pressure Distributors

"Tankar" Steam Heaters	Highway Brooms	Asphalt Supply Tanks
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BLACK TOP ROAD MAINTENANCE EQUIPMENT — LB — SINCE - 1900

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LITTLEFORD BROS., INC.

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MULTIPLE UTILITY

on CONSTRUCTION and MAINTENANCE JOBS

✓EXTRA-HEAVY-DUTY FRONT END ✓EASY HANDLING

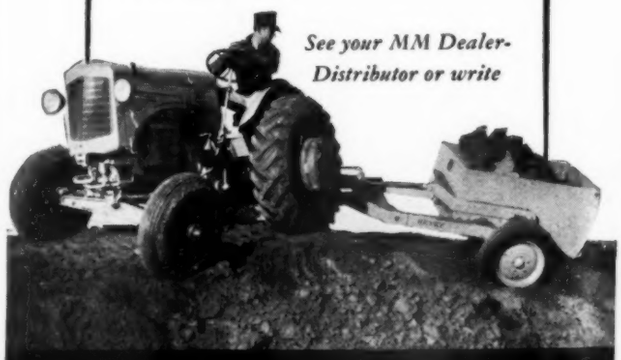
✓WIDE RANGE OF SPEEDS ✓ADAPTABLE FOR MANY ATTACHMENTS

✓FRONT OR REAR POWER TAKE-OFF

with MM MINNEAPOLIS-MOLINE MODERN MACHINERY **INDUSTRIAL TRACTORS**

The versatile, dependable 27 H.P. RTI and 49 H.P. UTI are the busiest, most economical equipment on many different types of jobs. Famous for low operating and maintenance costs, MM Industrial Tractors may be equipped with a wide variety of attachments *and this increased utility also reduces equipment investment!* Your MM Dealer-Distributor has complete information on the following attachments: Front-end Loaders, Dozers, Pull-behind Scrapers, Side-mounted and Pull-behind Mowers, Rotary Broom, V-Type and Reversible Blade Snow Plows, Winches and Cranes.

See your MM Dealer-Distributor or write



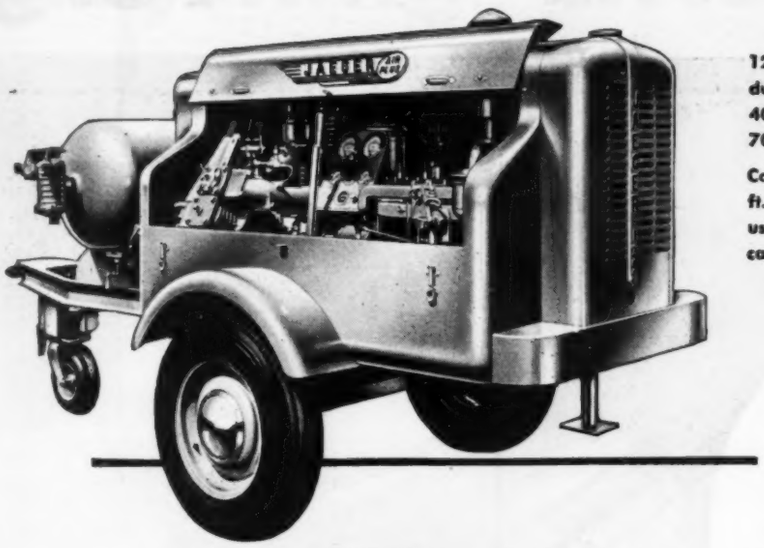
MINNEAPOLIS-MOLINE

POWER IMPLEMENT COMPANY

MINNEAPOLIS 1, MINNESOTA

"New Standard" 125 FT. Compressor does

40% more work yet sells at old 105 Ft. price



125 cfm of air runs 2 big breakers or 3 medium duty breakers at full 90 lbs. pressure — doing 40% more work than you can do with weak 70 lbs. pressure from 105 ft. of air.

Costs no more than old "single breaker" 105 ft. compressors, weighs no more, and does not use an ounce more fuel when its *additional* air capacity is not required.

Model 75 cfm — runs a heavy breaker, 2 light breakers or 3 tampers at 90 lbs. pressure — which a model 60 can't do.

Model 185 cfm — runs 3 heavy breakers or medium rock drills at 90 lbs. pressure — which a model 160 can't do.

Model 250 cfm — runs 4 heavy breakers, 2 heavy drills or medium wagon drill at 90 lbs. pressure — which a model 210 can't do.

Model 365 cfm — runs a heavy wagon drill plus rock drill or heavy breaker at 90 lbs. pressure — which a model 315 can't do.

Model 600 cfm — runs 2 heavy wagon drills plus heavy rock drill at 90 lbs. pressure — which a model 500 can't do.

All "New Standard" Air-Plus Compressors deliver more air to run more tools at full 90 lbs. pressure, yet cost no more than obsolete "old standard" sizes:

See your Jaeger distributor or send for new Catalog JC-8

THE JAEGER MACHINE CO.

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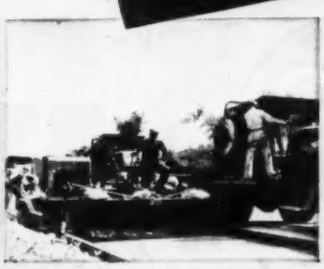
Diagonal Screed Finishers and Remixing-Compacting Screw Spreaders — team with today's mass-production pavers.

Model BP-5 Bituminous Paver Instant 8-12½ ft. adjustability, fast oscillating compactor and screeds, many other features.



Truck Pavers with Concrete Spreader — the mobile paving plant for half-width slab without detours, other concrete pours.

HYDRO-HOISTS with 2 Speeds, Hydraulic Control

SURE PRIME Dewatering and Pressure Pumps

SPEEDLINE Concrete, Plaster, Bituminous Mixers

Now! When You Orde
Forge

Tests Prove Service Life of Tuffy is Greater

"Wish to advise that the 'Tuffy' Drags which we said would go under 200,000 yds. went 432,371 yds. . . . this is the best average yardage we have ever had."

"This rope...gave 21 days service, which is over normal."

"This rope was installed April 16th and removed May 18th, a total of 27 days of service which is very good."

From all parts of the country, replies such as these verified the claims made by Union Wire Rope engineering specialists who designed Tuffy Draglines. In-the-field tests were made under severe operating conditions where Tuffy handled many types of material on different equipment. Tuffy's extra flexibility, abrasive resistance and stamina were challenged in digging, casting, and loading operations. Yet results of the tests were the same in all cases: Longer Life, Better Performance, Greater Economy.

Tuffy is a special rope for any and all dragline jobs. It is designed by the same specialists who have made hundreds of other Union Wire Rope products the standard of quality in the construction field.

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union *Wire Rope*

DRAGLINES . . . Everything Except

Tuffy DRAGLINES

are Built Tough to Meet all Operating Conditions

Extra flexibility and maximum abrasive resistance are built into Tuffy Draglines to assure dependable performance on any type of equipment—handling any type of material. Wet and dry dirt, sand, rock, gravel, cement, minerals, all give way to Tuffy's structurally tough construction. At high speeds or low speeds, Tuffy Draglines give top operating efficiency; they hold securely to drum when casting, ride better on grooves and are easier and safer to use. Put Tuffy to the test! He's built tough!

Just These 3 Specifications

Tuffy . . . Size . . . Length—that's all you order to get the RIGHT dragline for your particular job. No more confusing specifications, only to end up with a rope that is restricted to use under limited operating conditions. Now—in one simplified order—you get Tuffy Draglines designed to give maximum performance in *all* operations.

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☐ Send Complete Illustrated Folder on Tuffy Draglines.

For Tuffy Draglines — See Your Union Wire Rope Distributor (Listed in Yellow Section of Your Telephone Directory) and/or Send This Coupon.

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Reduce maintenance costs on highway and public construction—use Pentachlorophenol, the *modern* wood preservative.

Pentachlorophenol is a crystalline chemical specifically developed for wood preservation. It is applied to wood in low concentrations in suitable petroleum oils by pressure or non-pressure treating methods. Pentachlorophenol-treated wood is effectively protected against both termites and decay. What's more, Pentachlorophenol leaves wood clean and easy to handle, with no objectionable odor.

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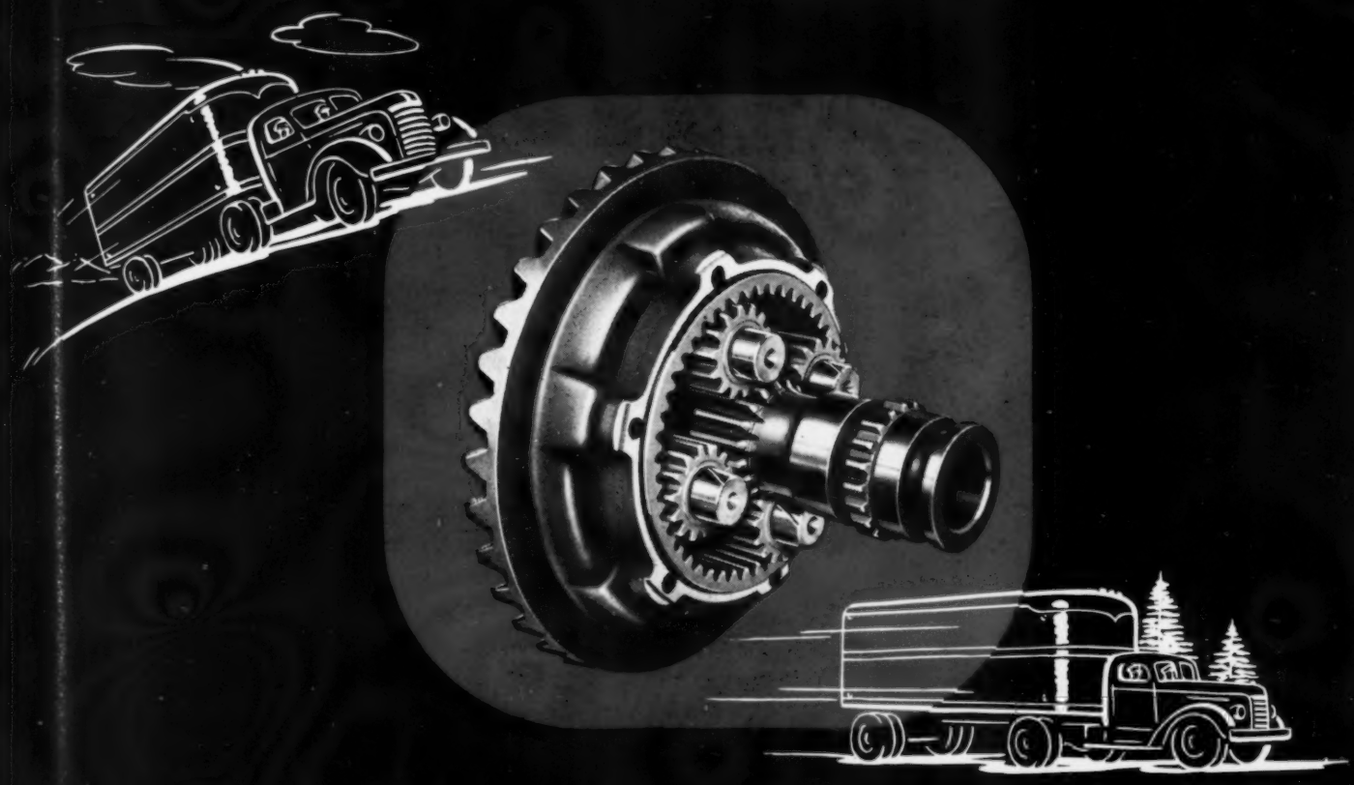
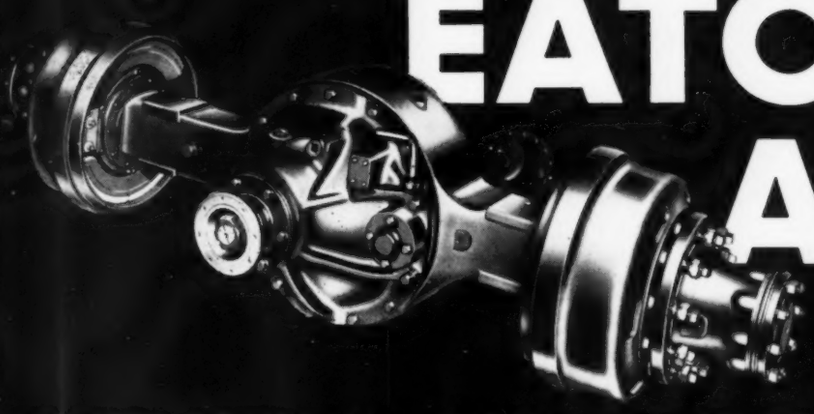
THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN



Eaton Planetary Construction Makes Shifting Easy at all Speeds

The design and construction of Eaton 2-Speed Truck Axles permit the planetary parts to turn at slow speed. This allows smooth, easy, clash-free shifting from one range to another at *all truck speeds*. The result—proper shifting for most efficient and economical operation, minimum driver fatigue, and longer life for the entire truck. Outstanding performance records are proof of Eaton quality and design. See your truck dealer for complete information.



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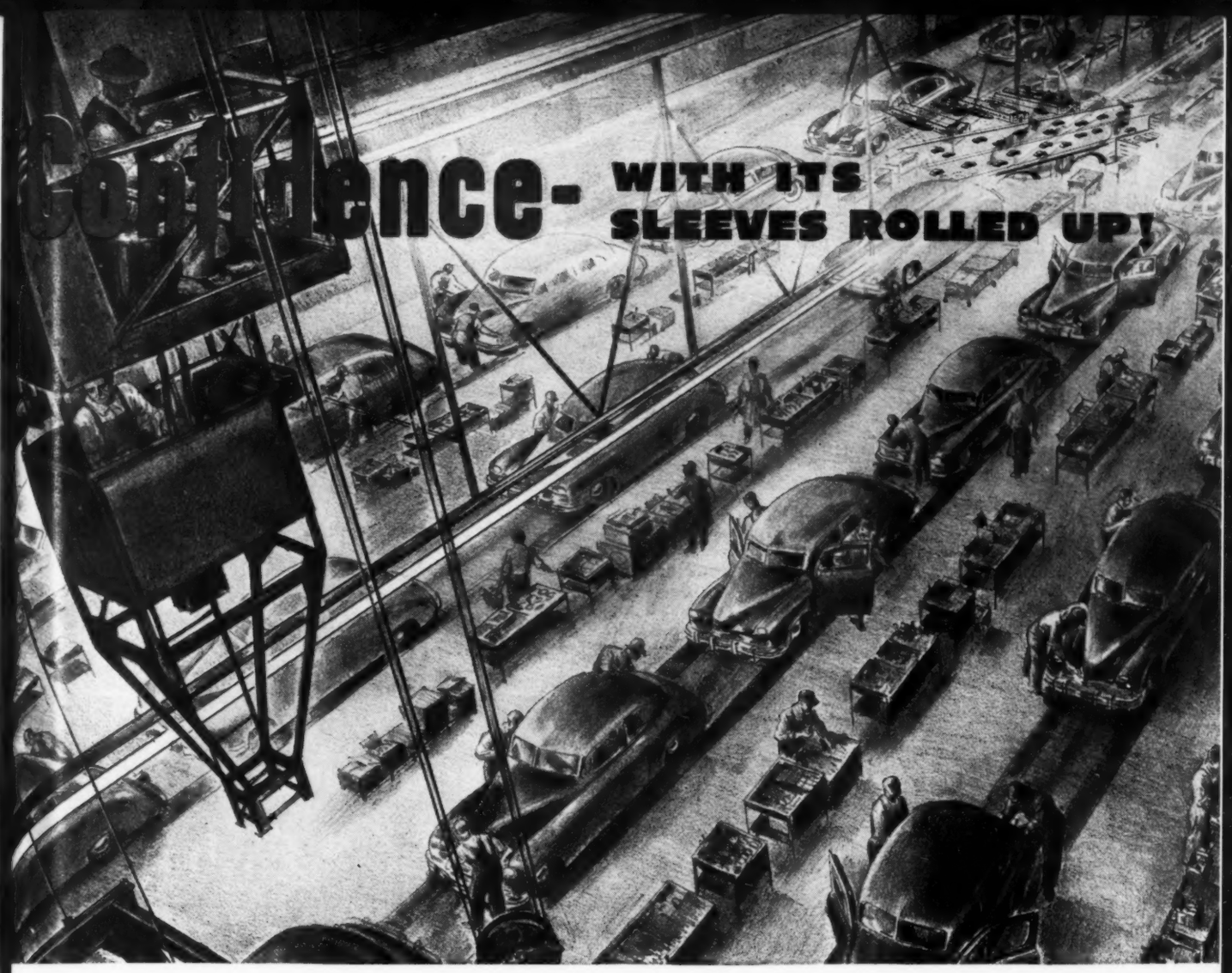

BACK OF SPEEDING LINES OF CARS are bustling production lines. And back of *them* is a vision typically American . . . a vision based on the confidence that industry could devise new techniques and place the one-time "luxuries of kings" within the reach of everyone.

With confidence like that, Roebling has led the way in developing and making products that are unsurpassed in performance and low operating cost. The confidence our products and engineering have won throughout industry is an asset that every Roebling employee works to preserve.

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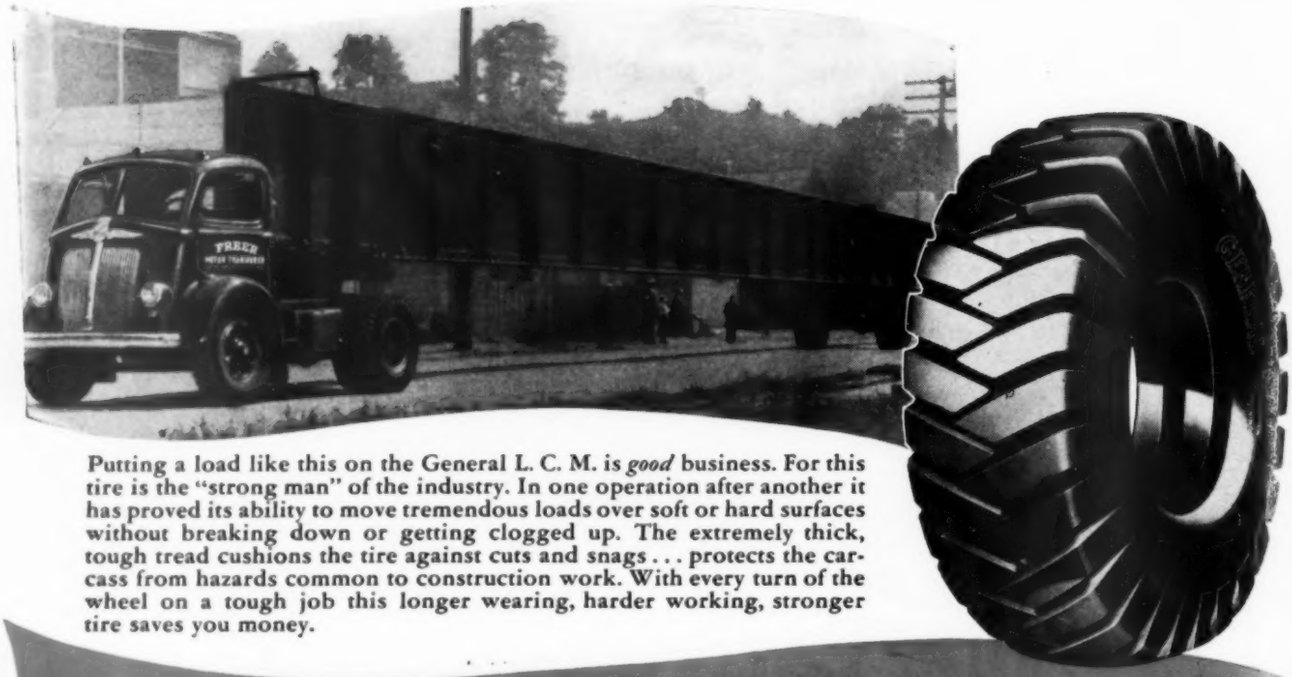

Putting a load like this on the General L. C. M. is *good* business. For this tire is the "strong man" of the industry. In one operation after another it has proved its ability to move tremendous loads over soft or hard surfaces without breaking down or getting clogged up. The extremely thick, tough tread cushions the tire against cuts and snags . . . protects the carcass from hazards common to construction work. With every turn of the wheel on a tough job this longer wearing, harder working, stronger tire saves you money.

To move loads and equipment *Faster and at Lower Cost*...have your General Tire dealer specify, install and service the tires for the job!

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The GENERAL TRUCK TIRE

THE GENERAL TIRE & RUBBER CO.

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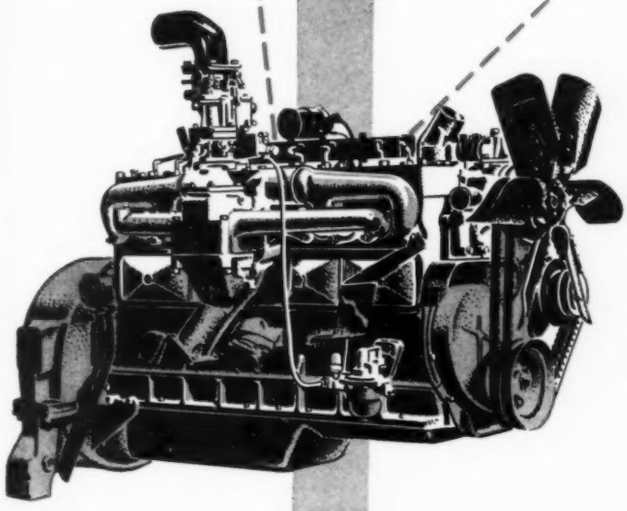
FOR A BETTER DAY'S WORK

IN FORESTS—ON FARMS—IN OIL FIELDS—IN INDUSTRY AND ON THE HIGHWAYS!



● Day after day . . . year after year, more and more lumbermen are specifying Chrysler Industrial Engines and Chrysler Industrial Power Units. They have learned *on the job* that Chrysler Industrial power is tough, dependable and economical. They know that each engine is backed by the skilled engineering and famed production of Chrysler Corporation—assurance of Horsepower With a Pedigree. You can count on Chrysler Industrial Engines For a Better Day's Work!

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HORSEPOWER WITH A PEDIGREE

INDUSTRIAL ENGINE DIVISION, CHRYSLER CORP., 12200 E. JEFFERSON, DETROIT 31, MICH.

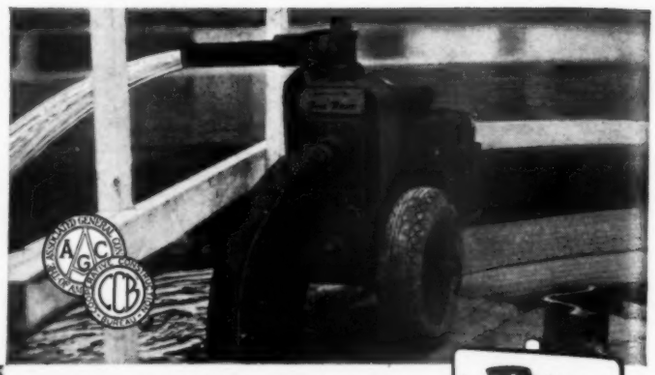
TWO-WHEELED TORNADO

Combining lightness, strength and efficiency, this Blue Brute 105′ Compressor is built for long years of trouble-free service. And exclusive Feather* Valves get *all* the air power out of every drop of fuel. Other Blue Brute Compressors from 30′ to 500′.

*Reg. U. S. Pat. Off.

BLUE BRUTES AT WORK

Owner: Plainfield Water Co., Plainfield, N. J.



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FAST, DEPENDABLE PICK-UP

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H8-3

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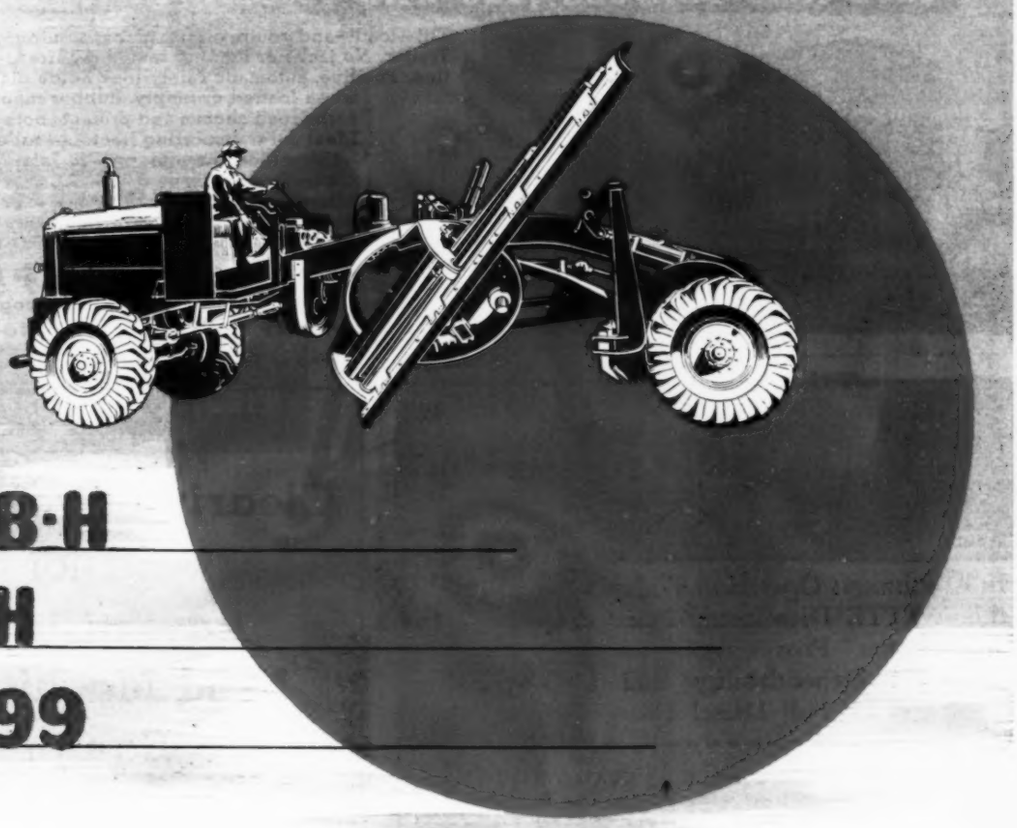
Worthington Pump and Machinery Corporation, Worthington-Ransome Construction Equipment Division, Holyoke, Mass. • Distributors in all principal cities

Your nearby Worthington-Ransome Dealer has the complete line of Blue Brute Construction Equipment. Write for his name.

IF IT'S A CONSTRUCTION JOB, IT'S A BLUE BRUTE JOB

All-Wheel Drive and Steer · High-Lift Blade · Extreme Reach · Full Hydraulic Control



88-H

99-H

Master 99

there is No Substitute

For All-Wheel Drive and All-Wheel Steer

in a motor grader . . . no way in which any rear drive, front steer machine can equal the maneuverability, power-at-the-blade, and all-around performance of an Austin-Western "88" or "99".

With All-Wheel Drive, there are no idling front wheels—no dead front end to consume power and decrease operating efficiency. All weight is on driving wheels—front and rear—contributing 100% to traction and utilizing the full power of the engine.

All-Wheel Steer provides unequalled maneuverability; saves time on every job; makes it possible to work in places where ordinary motor graders cannot go—do things they cannot do.

Get the complete story of the many additional features of these outstanding graders from your A-W distributor, or send for the latest bulletins.

AUSTIN-WESTERN COMPANY, AURORA, ILL., U.S.A.

BUILDERS OF ROAD MACHINERY

Austin Western

SINCE 1859

save time between jobs with JAHN TILT TRAILERS

Tilt—load—and you're off in a matter of minutes with a Jahn Tilt Trailer. No jacks or loading ramps required. One-man operation. Positive, automatic safety lock holds platform in position when loaded or empty. Rubber mounted drawbar absorbs road shocks and protects both truck and trailer. Ideal for transporting tractors—rollers—compressors—shovel-loaders—mixers, etc. Jahn Tilt Trailers are available in 8 ton capacity tandem axle and 5 ton capacity single axle models. Write for specifications and illustrated bulletin or see your nearest Jahn distributor.

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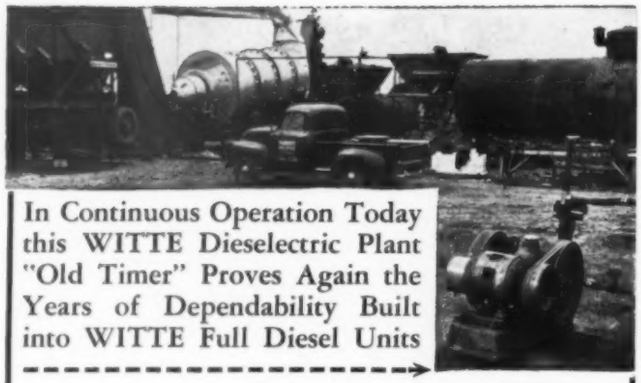
Heavy duty trailers from 5 to 100 tons



In Continuous Operation Today this WITTE Dieselectric Plant "Old Timer" Proves Again the Years of Dependability Built into WITTE Full Diesel Units

Now in its twelfth year of service, this 5 KVA-AC WITTE Dieselectric Plant is mounted on skids for quick shifting from one working location to another by Mid-West Pre-Cote Co., Kansas City. But it's an "old timer" only in looks—for its dependable performance keeps it on the job, delivering low-cost, abundant electric power while still requiring only a minimum of attention.

Every WITTE Dieselectric Plant is a Full Diesel —Starts and Operates on Cheap Fuel Oil

10 KVA WITTE Dieselectric Plant with Condenser Cooling System

Thousands of WITTE Diesel units are in use throughout the world. Heart of each is the famous WITTE *full-Diesel* Engine, simple, sturdy, compact. Having ample electric power constantly available—*at such low cost it can be used unsparingly—multiplies savings and profits for WITTE Dieselectric Plant users.* There's a size and type to meet your needs—condenser, tank, or hopper cooling systems as required. Have an all-Diesel operation; keep risky gasoline off your jobs. Write *today* for literature.

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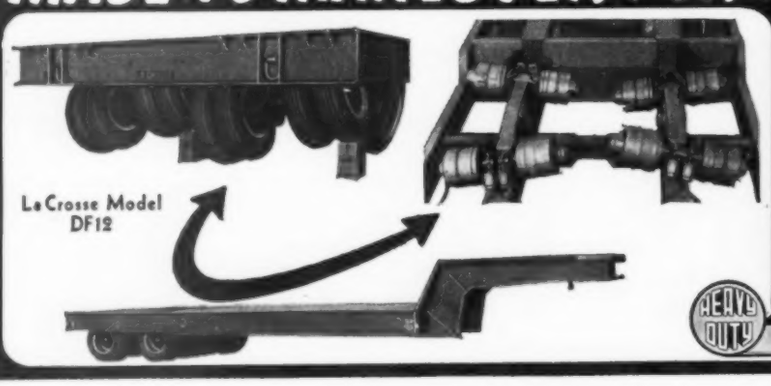
MADE TO MANEUVER FOR HEAVY HAULING



La Crosse Model DF12

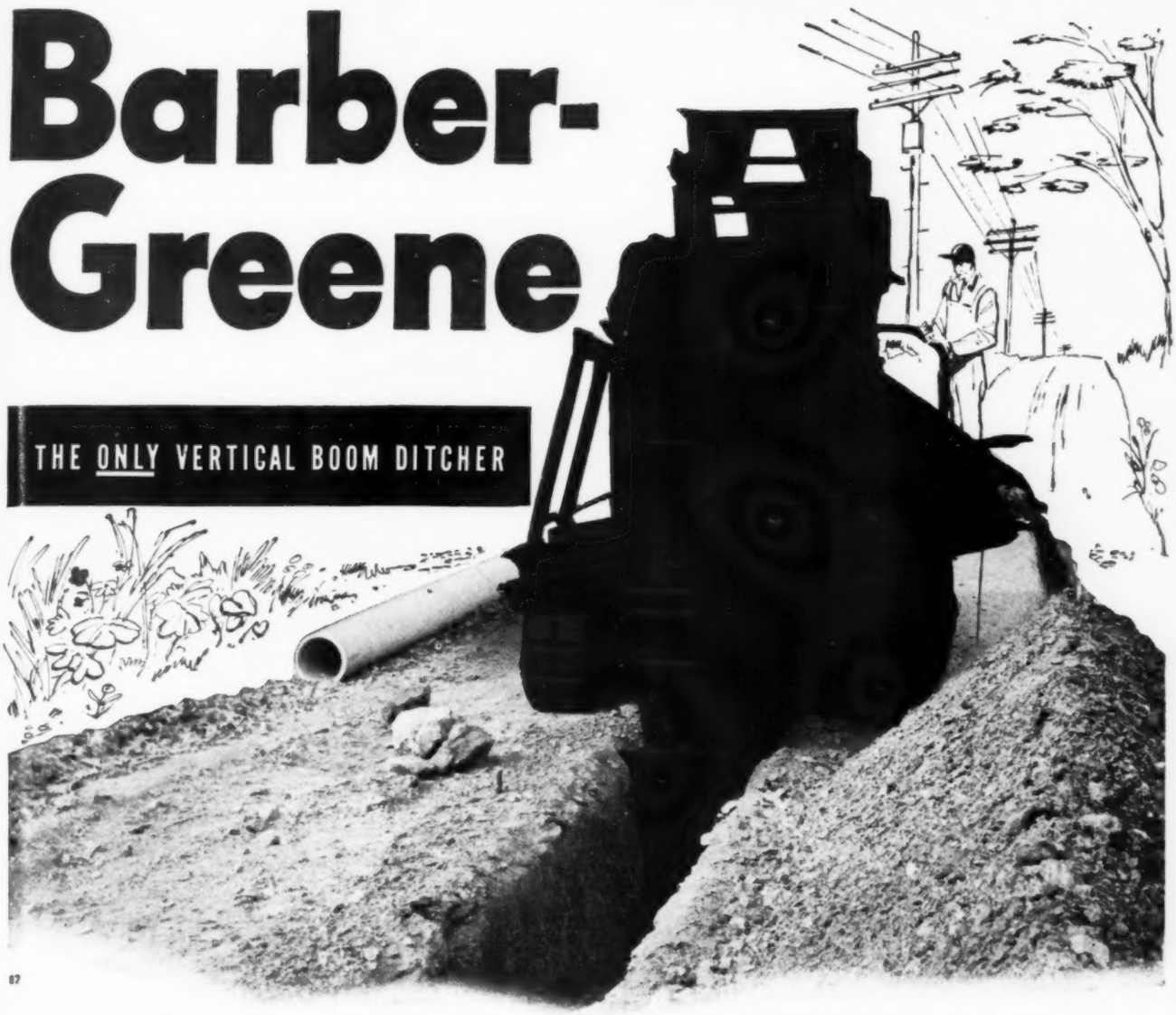
The La Crosse Model DF12 - 16 wheels - with capacities from 40 to 67 tons - is designed to provide the same maneuverability and flexibility as the medium sized La Crosse Trailer models.

Dealers in 48 States

HEAVY DUTY **LA CROSSE** TRAILER CORPORATION — LA CROSSE, WISCONSIN

Barber-Greene

THE ONLY VERTICAL BOOM DITCHER



digs clean—leaves no ramp • discharges on either side

Here's an exclusive ditcher feature that saves a lot of hand labor. The Barber-Greene's vertical boom digs *straight down*, right up to walks, foundations, underground piping and mains, etc. *There's no ramp to run up digging costs.*

Closely spaced, self-cleaning "kick out" buckets, traveling at high rate of speed, cut like a milling machine . . . leave a clean-walled trench. It's this efficient operating principle that gets the B-G Ditcher through materials as tough as coral rock — down to 8 feet, 3 inches; widths up to 24 inches. Feeding speeds range from 10 inches to 8 feet per minute.

An adjustable spoils conveyor discharges on either side, and the automatic overload release protects both the machine and hidden objects.

Find out how this compact, maneuverable, easily controlled unit can keep your trenching costs down . . . and what varied work it will perform.

BARBER • GREENE COMPANY, AURORA, ILLINOIS

Constant flow Equipment

LOADERS | PERMANENT CONVEYORS | PORTABLE CONVEYORS | COAL MACHINES | BITUMINOUS PLANTS | FINISHERS | DITCHERS

Checked to meet rigid road specifications... for over 20 years

ON THE MOST exacting jobs, Midwest contractors and public officials have been specifying Ohio Oil Asphalts for over 20 years. Low cost or high cost construction, Ohio Oil Asphalts have the proved characteristics that insure long life, greatest economy and fewest repairs.

The Ohio Oil Company manufactures a complete line of all grades of rapid, medium and slow-curing asphalts and asphalt cements.

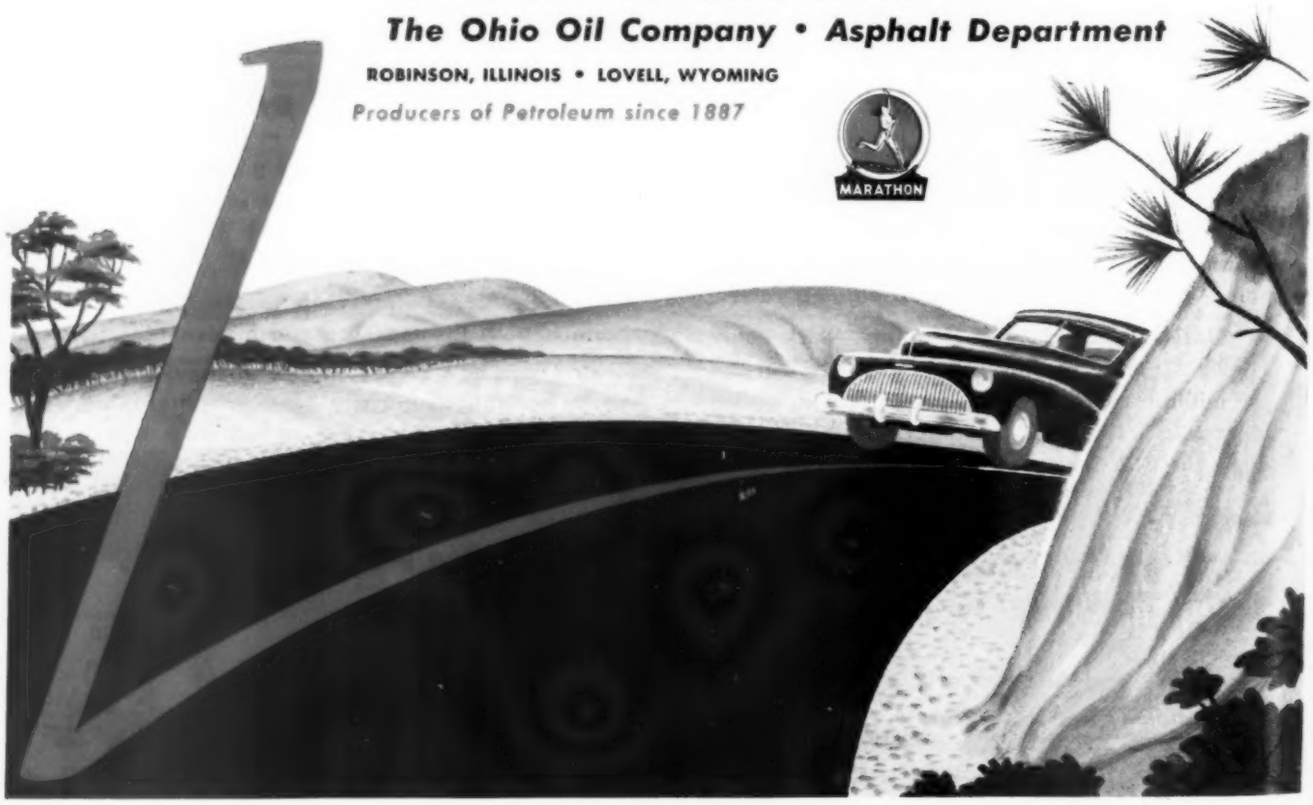
OHIO OIL COMPANY ASPHALTS

The Ohio Oil Company • Asphalt Department

ROBINSON, ILLINOIS • LOVELL, WYOMING

Producers of Petroleum since 1887

MARATHON



HITTING A NEW HIGH...

in low loading Cost!

A bucket close to the tractor when digging, but with high forward reach for loading.

Only one lever hydraulically controls and operates the bucket!

OLIVER "70"

Industrial Wheel Tractor with Ware Front End Loader

The Oliver "70", a streamlined industrial tractor with modern engineering throughout, together with the Ware Front End Loader attachment, is fast becoming a familiar sight around construction jobs that *move.* It's a tough unit that bites into the high cost of such jobs as hauling, loading, ditching, filling in, or removing snow . . . plus performing a score of other tasks.

Then, too, the Oliver Industrial "70" with the Ware Loader is compact . . . well balanced . . . low to the ground so that it can operate in tight quarters. It makes handling gravel, cinders, loam or other loose material a pushover. Here's a unit that will load up to 8½ feet . . . dump at any height. Substitute a blade for the bucket and you have one of the huskiest, easiest-to-get-around backfillers you've ever seen in operation.

You "go longer" per gallon of fuel because the "70" with the Ware Loader is equipped with the 6-cylinder "Fuel Miser" engine. Drop in at your Oliver Industrial Distributor. Learn firsthand about the many new engineering features that will help you *hit a new high in lower loading costs!*

Loaded . . . bucket up . . . you can move a full ton . . . accomplish more . . . faster!

Substitute a blade for the bucket and you have a fast-working backfiller.

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INDUSTRIAL DIVISION: 19300 EUCLID AVENUE, CLEVELAND 17, OHIO

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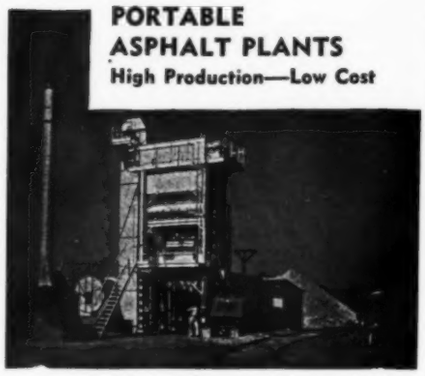

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All widths lengths, and thicknesses, punched ready to fit your machine.

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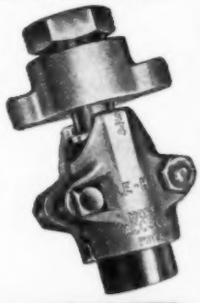

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TYPE "D" HEAVY DUTY BUCKETS

For severe service in excavating and dredging hard materials. Heavier and more rugged than Type "M" with longer and larger lower arm bearings. Sealed from grit.

Type "DX"

Still heavier than "D" with extra large shafts and bearings. For dredging and the severest kinds of excavating.

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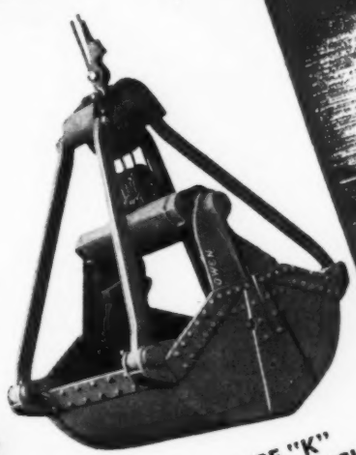
Primarily for excavating but efficient in handling compact materials, large crushed rock, etc. Overloads in loose materials.

Narrow buckets available for trench and cramped excavating.



TYPE "K" STANDARD BUCKETS

For rehandling bulk material. Light but strong. Can be equipped with counterweight jackets, also bottom teeth for certain kinds of digging.

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Built lighter for greater capacity in materials which do not require the weights of the Standard Type "K" for penetration.

GRAPPLES

of various designs are available for handling stone, scrap iron and pulpwood.

TYPE "S" BUCKETS

Wider and heavier than corresponding sizes of "K" Buckets. For unloading barges, flat cars, stock pile work, etc. Good for "clean up".

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Lighter than Standard "S" Buckets but designed to have equal strength and durability.

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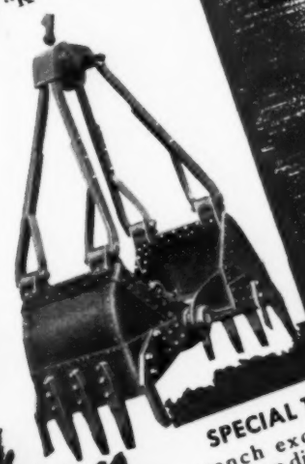

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for trench excavation and straight down digging with vertical and parallel walls are available for "M" and "D" Buckets.

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ALL the features you want and need are yours in the FWD Model HG Maintainer.

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- The comfort and convenience of a modern driver's cab makes the FWD "HG" an all-weather, all-season unit of equipment.

You can go to and from the job faster — maintain more miles of road per day — cut maintenance costs up to 30% to 50%. The FWD "HG" is the Maintainer for many jobs — equipment that has no idle season.

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Canadian Factory: KITCHENER, ONTARIO

FWD

America's Foremost Heavy-Duty Truck

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Play safe with BAKER

This winter you can keep your streets and highways open if dependable Baker plows are on the job. Baker truck plows are built for high speed plowing, with specially curved moldboards that throw the snow high and wide with a minimum of truck power. Light in weight, but sturdily constructed and rigidly braced, Baker truck plows are ready to tackle the toughest jobs. Tripping blades enable pavements to be swept clean without injury to surfacing. There is a Baker V type, one-way or reversible for any job and any truck.

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Whatever your snow problem may be, there is a proper size and type of Baker plow to suit your needs. Prepare now to keep your roads and streets open this winter. Send for new literature, Today.

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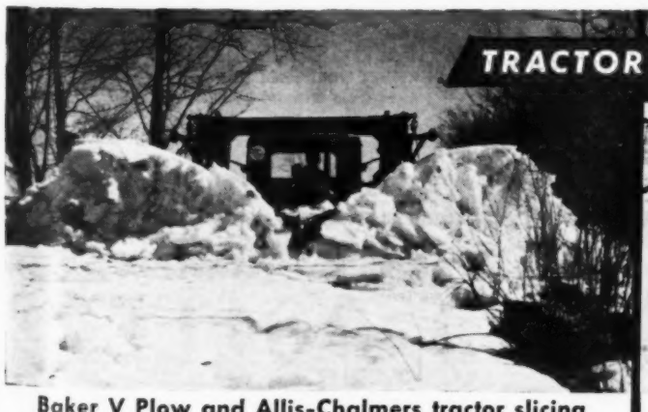
TRUCK • TRACTOR • GRADER PLOWS SINCE 1908



Baker V Plow and Allis-Chalmers tractor slicing through and widening deeply drifted highway.

Baker Plow on Allis-Chalmers wheel tractor cleaning walks and intersections.

The versatile cost-reducing Maintainer.

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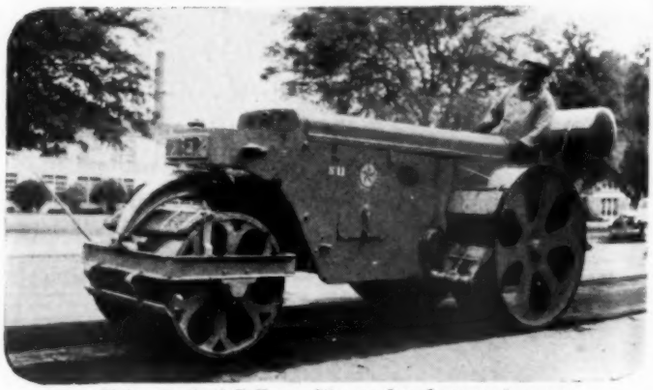
You can really step up the efficiency of road building operations with modern hard working Huber machinery. Huber road machinery is built to do your job . . . do it faster . . . better . . . and for less.

Huber machinery will permit you to employ real cost-saving methods. The extra reliability and added service life built into each piece of Huber equipment makes Huber machinery a foremost choice among road construction and maintenance men everywhere. Take your cue from this reputation for efficient low cost operation and at the same time realize a greater profit on your equipment investment. After a trial, and cost comparison you will see why Huber machinery produces more favorable results in all phases of road work under all conditions. Write today for descriptive bulletins and name of your nearest Huber dealer. He can help you save money.

Huber Variable Weight Tandem Rollers
Sizes from 3 to 14 tons.



Huber 3-wheel Rollers with speed and power to spare
Sizes from 5 to 12 tons.

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ROAD ROLLERS *and* MAINTAINERS

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By the three points above, you can prove to yourself how International Trucks can do more for you.

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Tune in James Melton on "Harvest of Stars." CBS Wednesday Evenings

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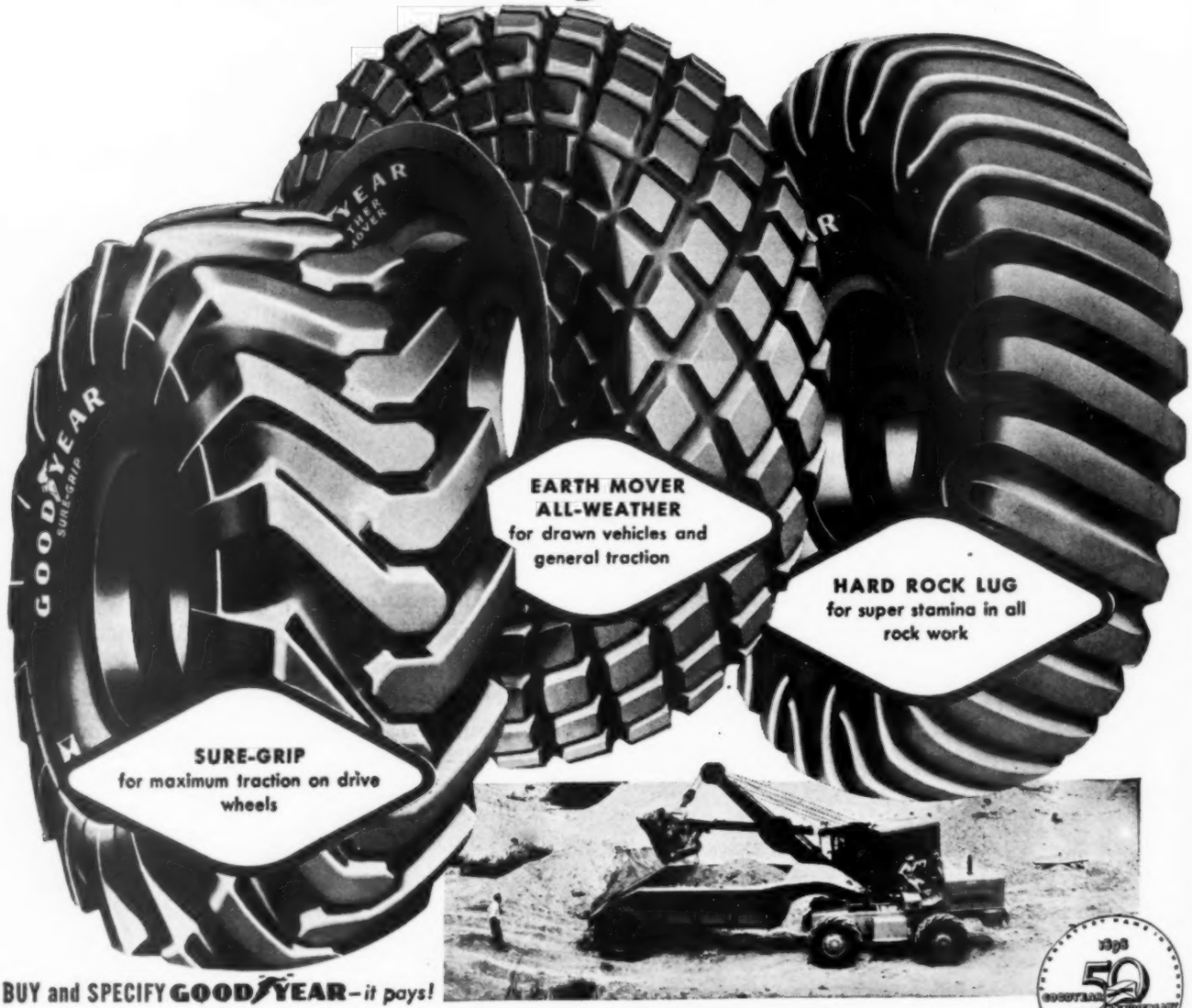
More yards are moved on Goodyear off-the-road tires than on any other kind



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1898 GOODYEAR 50 1948

GOODYEAR

Sure-Grip, All-Weather—T.M.'s The Goodyear Tire & Rubber Company

It Was a Swell Show

YOU sure missed something if you weren't there!

Any way you measure the 1948 Road Show it was a record smasher. Engineer-director Charles M. Upham and president J. T. (Tom) Calloway of the American Road Builders' Association, are to be congratulated, along with a special word to the whole ARBA staff, the committee leaders and speakers, the numerous cooperating organizations. And don't forget the exhibitors themselves, and their distributors, who really *were* the Show. And an extra special bow to Miss Wynne of ARBA headquarters, exhibit manager, who can tell you that any big fair is a thousand headaches and this one was a million.

As this is written, day after the close, it is hard to assay this spectacle. Right now, while our aching dogs are still recovering, about all we can recall is the huge expanse of the thing. Thirty acres. Miles of equipment lined corridors. 330 exhibitors. $25,000,000 worth of stuff on display. Stretched over the site of the 1933 World's Fair, this was indeed a world's fair of road building. The international importance was emphasized by the presence of a thousand visitors from 56 foreign countries. Their attendance combined with the world-wide advance publicity will accelerate the Show's influence on construction methods and on highway and airfield development throughout the world.

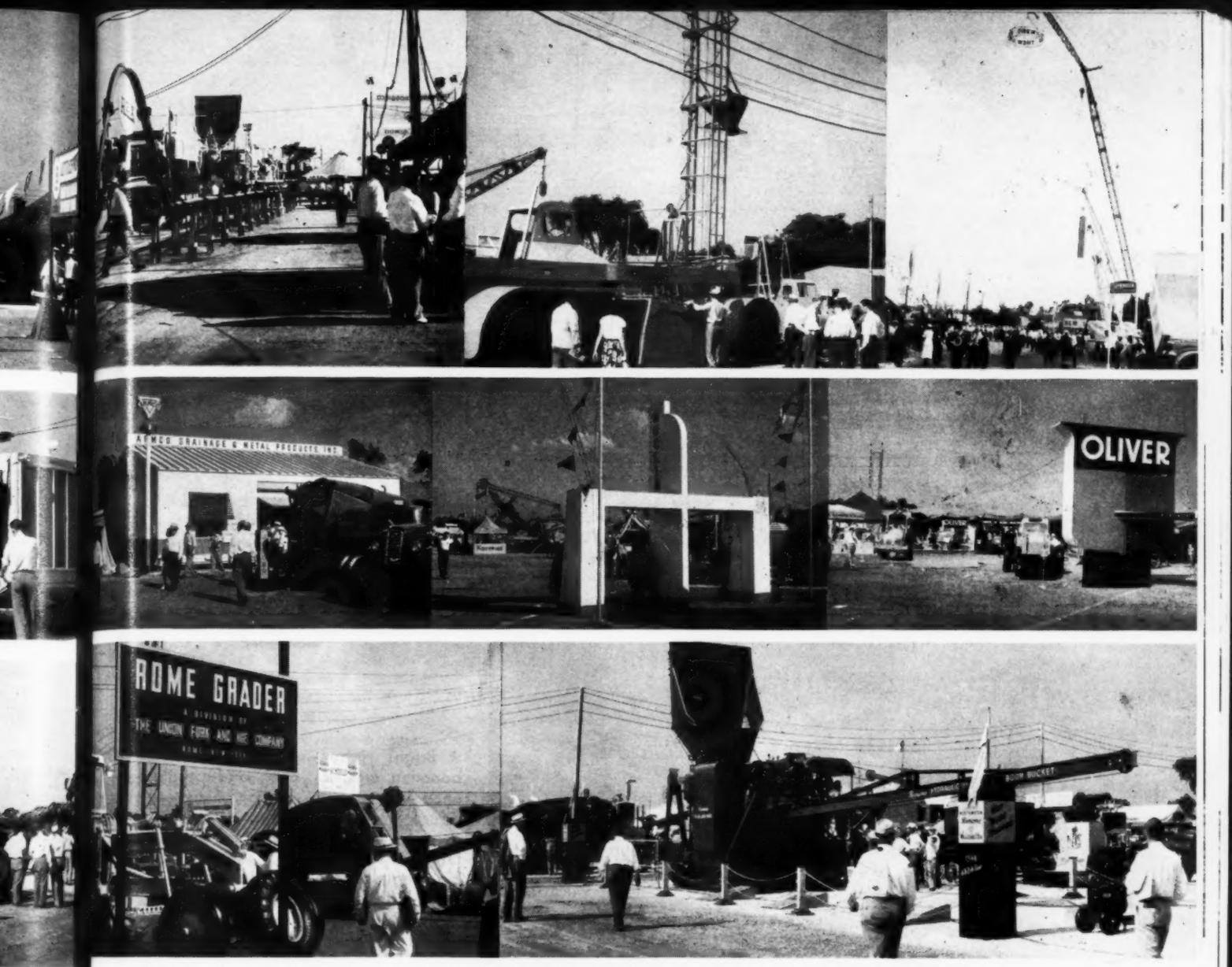
International Day, the second day, was marked by a colorful ceremony which included addresses by Dr. Alberto Lleras, secretary-general, Organization of the American States (Pan American Union), Hon. Dennis Chavez, U.S. Senator from New Mexico, engineer-director Upham of the Road Builders, and several high officials from Washington. The Show also was the occasion for presenting the Pan American Highway Award for distinguished service to international

★ Colorful was the word for the Road Show on Chicago's lake front

highways and international friendship, to Dr. Clovis Pestana, minister of communications and public works of Brazil, and to William Harrison Furlong of San Antonio, director-general of the Inter-American Highway Association. ARBA's Pan American division president, Pulido y Morales, of Cuba, presided. Robert B. Brooks, of St. Louis, headed the award committee.

300,000 Through Gates

How many attended? We're informed that the turnstyles clicked 300,000 times, and that 125,000 different people were there. It is too soon to have a detailed report on just who attended and who didn't. But some of the states were represented by nearly a clean sweep of their active road contractors. Some spottiness is hinted, particularly among engineers and public officials. The western highway departments' engineers were rather scarce, it seemed, due possibly to the unfortunate timing of the Western highway conference at Portland right on the heels of the Show. We saw the veteran equipment man, Stalnaker, of the California division of highways—but where were the rest of the California bunch? And what of the many division engineers from, say Texas,



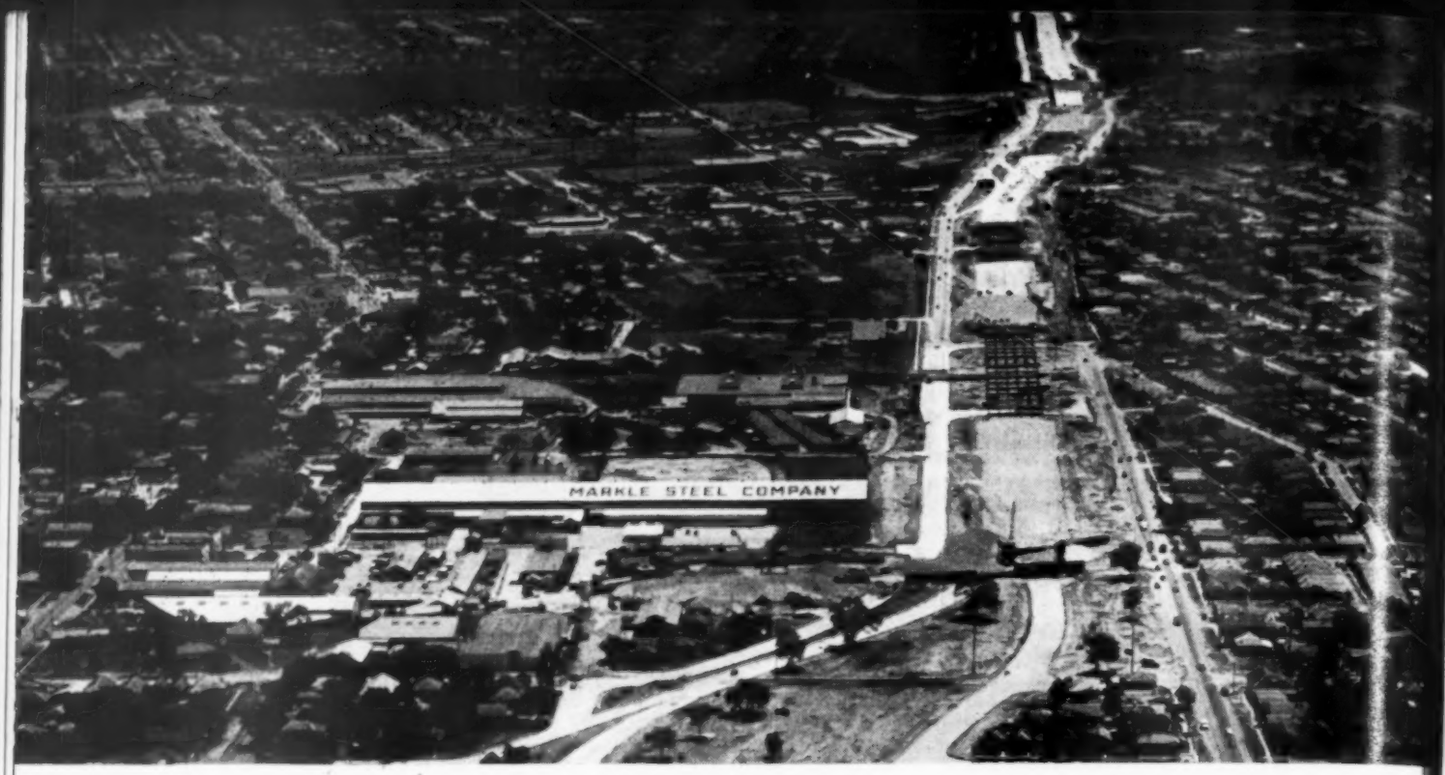
★ These snapshots were taken at random by the Roads and Streets editors

who ought to have been in Chicago but weren't?

But all in all the exhibitors were happy. Whereas one company official told us that "we're just standing around selling each other," scores reported selling their equipment off the lot and lining up more husky orders. More important, innumerable visitors surely went home with new ideas under their straw hats. As observed before in these columns, the commercial value of this or any Road Show is a long-range one. One contractor said that seeing the Show was like trying on a new suit. The old suit (and road equipment) looks baggy and gravy stained afterward. The Show, while long-range in its influence, was immediate, however, in showing up the obsolescence of many an equipment unit now in operation, regardless of age or condition.

Distributors and the part they play in modern road building methods were spotlighted in the first day's ceremony, in which Associated Equipment Distributors' president, A. F. Garlinghouse of Los Angeles, was honored, with Chicago's mayor Kennelly and Illinois Governor Green on the program.

(*Continued on page* 80)



●

★ Bright ribbon of hope! Houston, a booming city, is young and progressive enough to seek the solution of present and future arterial congestion by boldly conceived expressways. As in many other cities, the mantle of leadership in their planning and execution has fallen to the state highway department

●

Progress on Expressway Construction in American Cities

HOUSTON

Beginning a series of pictorial articles by the Roads and Streets editorial staff reporting details of noteworthy projects

Harold J. McKeever
Editor, ROADS AND STREETS

HOUSTON is the scene of expressway progress which excites the imagination and rekindles hope for congestion-weary people in other American metropolitan areas.

The eventual plan for Houston calls for three radial highways, converging near the downtown district on a new block-wide right-of-way. Express roadways are to be six-lanes divided, and a system of flanking service roads and entry and exit lanes, plus overpasses at principal cross streets and railway lines, will assure non-stop limited-access traffic movement across the city. Expressways are at grade between overpasses, which involve easy vertical curves.

Phases of the program and the engineering work have been reported in recent issues of ROADS AND STREETS As with the good progress also being made in Fort Worth, Dallas, San Antonio and some smaller Texas cities, planning and construction of urban expressways in Houston are directed by the Texas highway department. This agency has vested extraordinary powers of planning and decision in an engineer-manager, whose job includes that of coordinating the effort of all local governmental agencies [R&S Nov. '45].

Beginning late in 1946, contracts aggregating over $7,000,000 have been let, and other parcels are soon to be offered. Construction progress to date can be summarized as follows:

1. Over $4,500,000 in city funds has been expended to date to acquire right-of-way.

2. Approximately 8,000 lineal feet of 6-lane divided express roadway is completed along the 4.8 miles of Project I (see sketch). Another mile of express roadway is graded, and flexible base and pavement construction in progress.

3. Some 20,000 lineal feet of 2-lane concrete service roadway is completed, and much of it serving to help move about 10,000 vehicles daily along the general expressway axis. Each month additional blocks of pavement are being opened to an eager, insistent traffic stream.

4. The much-publicized 4-street system of parallel streets, employing 256 synchronized automatic traffic signals at 64 street intersections in a single operation unit, is now in use. [R&S Nov. '47]. This system receives and disperses expressway traffic as it approaches and flanks the business district.

5. Extensive storm-sewer installations required to serve the wide right-of-way and pavement area has been completed along 3.8 miles, at a cost of $1,400,000.

6. Six major grade separation structures totaling 5,000 ft. in length are in stages of completion ranging up to 95%.

Citizens' Excitement Growing

The people of Houston as a result of this tangible beginning have wakened up to their new expressway "starting out toward Galveston." Even in the uncompleted stage it is beginning to impress the eye with its streamlined expanse of pavement and its spectacular modernistic "roller-coaster" style overpass structures.

A previous article [ROADS AND STREETS, June '47] described the design features of the bridges, which include slender cylindrical pier columns extending to firm clay via holes power-bored and under-reamed through stiff clay. Some of the

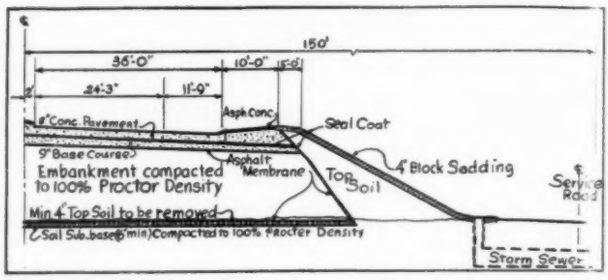
(Continued on page 61)

★ Looking toward downtown Houston, whose skyscrapers are visible on the horizon at right. Overpass from which photo was taken is complete except for handrail; the next overpass is seen rising roller-coaster fashion in distance

Details of Asphaltic Membrane Application Designed to Hold

★ Placing hot asphaltic membrane on 2 to 1 side slope of approach fill

★ Another view showing hand application of membrane, which was designed to completely envelope the clay fill



★ Cross-section through bridge approach fill, showing asphaltic membrane details

How Are Expressways Coming in Your City?

Metropolitan expressways represent a new evolutionary step in the transition of our cities into the motor age. Conceived back in the 20's and 30's, the basic need for them was quickly grasped by the millions who were already aware of the suffocating effect of traffic congestion on business and civic growth. The mounting toll of traffic deaths spurred civic leaders to speed expressway planning. At the beginning of the war many cities were well on the way toward soundly conceived programs. New York City with its parkway system, Los Angeles with its Arroyo Seco, Chicago with its Outer Drive, and a few other cities with "seedling" projects were demonstrating the value of this new order of trafficway.

Which Cities Progressing?

Then came the war days. Planning went ahead slowly in some cities in spite of wartime handicaps. Certain projects were pushed, where roadways were needed for war plant access. At the end of the war, a score or more metropolitan cities found themselves with varying "paper" programs, financial outlooks, and political situations. The state highway departments under Federal Highway Act of 1944 assumed increased responsibility in cutting across local governmental lines and planning urban expressways—projects which are links in an intercity network but more immediately designed to get traffic into, out of or around "downtown" business districts.

What progress has been made on urban expressways in the three years since V-J day? Some cities have made virtually none, nor has much headway been made in their behalf. Plans have "fallen through" or just plain bogged down due to a diversity of reasons. There are those who are disposed to cry "politics" and curse councilmen, state legislators, local merchants and certain citizens as short-sighted obstructionists. But we should pause and realize that the limited access highway represents a major surgical operation that literally involves ripping open the patient's belly to save its health or very life. It is a painful, revolutionary thing, and one whose cost was far underestimated at first. Also one whose political and economic and engineering ramifications transcend any problems previously experienced by highway builders or city planners. Planning became a big-time big-scale task, and a technique for finding and presenting information to the public and its leaders, as a basis for enlightening a citizenry, had to be perfected and put into operation.

We've Come Far

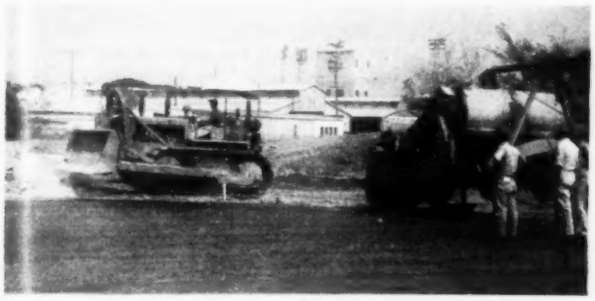
In short, we should feel encouraged rather than discouraged at the progress being made in urban expressway development. Results will crystalize faster from here on, almost everywhere. Meantime, in New York and Cleveland and Los Angeles and Chicago and also numerous other cities in the quarter-million and larger brackets, limited access construction projects are progressing in increasing volume. In other areas the painful and laborious and costly business of acquiring and clearing rights-of-way and solving legal and financial problems, is being pushed with vigor. Such problems as where to move home owners from condemned property, or how to get steel for structures, are of a transitory nature. A more serious and far-reaching problem—present almost without exception—is that of achieving better coordination of the city government in the betterment of municipally controlled arterial streets, in relation to expressway projects financed and built by state highway departments or other broader agencies.

Moisture at Optimum in Compacted Clay Roadway Fill

Texas Highway Department photo

★ Dozer works protective cover against toe of membrane

★ Distributor used for the bottom and top membrane layer

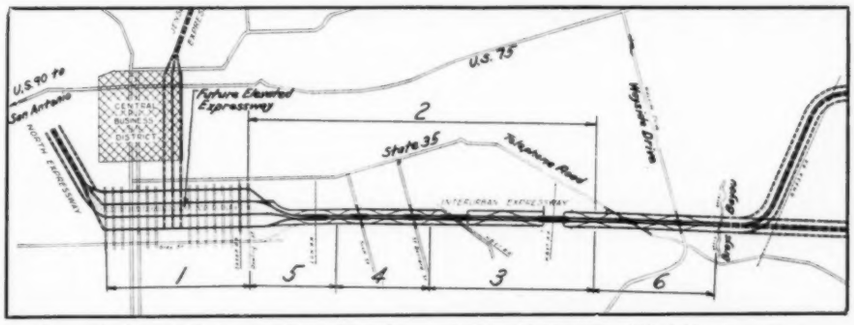


★ After the rolled subgrade is membrane-sealed, a protective layer of granular earth six to twelve inches deep is spread with scraper and dozer

★ As part of envelopment of clay roadway fill, slopes under abutments are asphalt coated, then paved. Asphalt shown in place; note trench for concrete footing

features of these interesting structures are pictured herewith, along with glimpses of forming and other construction details not previously described.

Also previously reviewed in R&S [July '47] is the bold scheme of utilizing the A-7 clay as roadway fill material under bridge approaches and as subgrade under roadway sections at grade. The design cross-section (see sketch) includes a heavy membrane of asphaltic cement, designed to maintain optimum moisture conditions provided during compaction. This membrane is placed hot at rate of 1.0 gal. per sq. yd. Membrane is placed over a subgrade previously re-



★ General plan of Project 1, first phase in development of Houston's urban expressways, showing location of the first six contracts: (1) 1.1 mile grade, storm sewers, pave, signal system on 4 parallel streets; Oct. '46; Brown & Root, Inc., $1,042,000. (2) Storm sewers for 2.2 mi., Nov. '46; R. P. Farnsworth & Co., $1,328,000. (3) 1.17 mi. expressway, May '47; Brown & Root $2,262,000. (4) 0.65 mi. expressway except sewers, April '47; Brown & Root, $1,242,000. (5) 0.700 mi. expressway, except sewers, Sept. '47; Brown & Root, $1,300,000. (6) 0.58 mi., Oct. '47; R. P. Farnsworth, $1,430,000

★ Stiff clay! Clean-up excavation in progress along Brown & Root's expressway sections. Insley dragline; Wooldridge Terra Cobra with D-8 Caterpillar snatch loading

★ Concrete for the deck was supplied by ready-mix truck, crane and drop bucket

★ Express roadway nearing completion, as seen from a service road. Entry lane at left

lieved of top soil and compacted to 100% Proctor for a depth of 6 to 12 in. using sheepsfoot and pneumatic rollers. A membrane is also placed over the top of the completed fill, and carried down the sides at a 2 to 1 slope to form a complete envelope, the side membrane being covered by topsoil. This work has progressed as planned, and the highway department engineering staff has run extensive tests, both routine and of a special nature, from which it expects to correlate moisture, density and bearing power test data taken during construction with similar data taken at intervals under traffic.

A pressure distributor is used to place the bottom and top membrane layer, the bottom membrane being immediately covered with about 6 to 12 in. of protective fill material brought in by scrapers and leveled with dozers. The sloping side membrane is being placed with a hand-held spray nozzle.

Before placing concrete pavement a flexible base layer is being placed using motor grader, pneumatic roller and sprinkler truck for spreading and compaction, followed by 0.3 gal. seal and chips.

Field Test Program

Engineering design is being followed up by field tests on the various structural components of the expressways as construction proceeds. In addition to routine field control tests for moisture and density during construction, the quality and condition of earth and base construction has been checked in the field as follows:

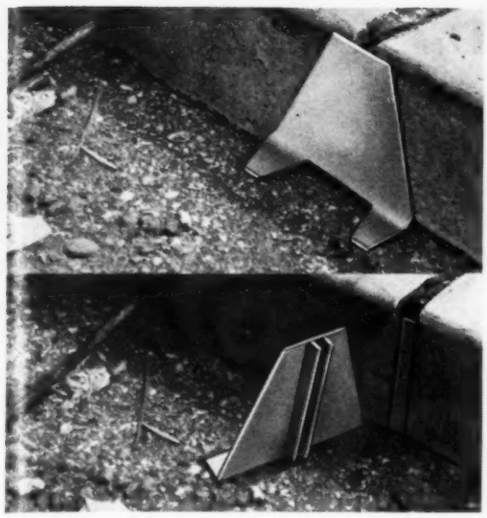
a. Undisturbed cores of completed fill have been taken by sampling in shafts for under-reamed footings being excavated through the fill. Triaxial compression tests of these cores indicated strengths intermediate between that of the poorest soil type investigated in design stage and that of better soil types known to be present in the fills.

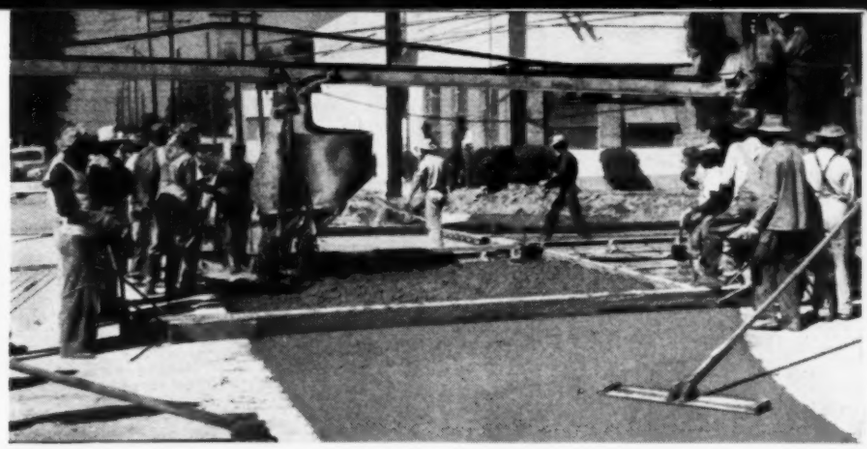
b. Field load-bearing tests of foundation for concrete pavement have been made using rigid plates of various sizes bearing directly on top of completed base course prior to placing concrete pavement. Tests made in cut and fill sections, constructed approximately 6 months prior and subjected to heavy rains during an unusually wet season with no protection other

Preparing Flexible Base for Expressway Concrete Pavement

★ Above: After compacting soil sub-base, a 9-in. granular base course was spread and rolled by ordinary procedures

★ Below: Moisture was controlled with care in the flexible base as well as fill. Left below: Sealing the base, after which it is chip coated and ready for the concrete pavement. Distributor began and ended this run on strips of paper

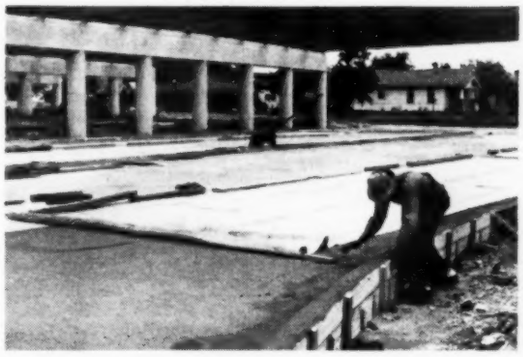




★ Paving an intersection along service roadway. The Koehring 34-E dual-drum paver shown reached 500 cu. yd. daily output in spite of shortness of express lane runs. Brown & Root, contractor

★ Special metal plate devised to insure cleanly formed joints at lane edges and backs of curbs. Parallel fins hold wooden expansion joint securely in position. This plate is easily set against inside face of form. The two "toes" extend under form as anchorage. Also easily removed for re-use, as shown here

Concrete Pavement Joint and Surface Details Finished to Close Tolerances by Skilled Workers

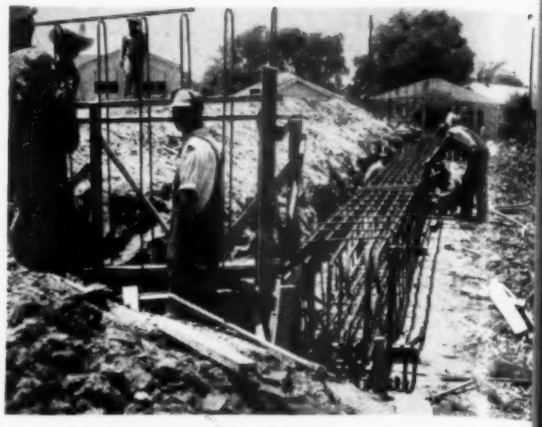


★ Paper cure was specified

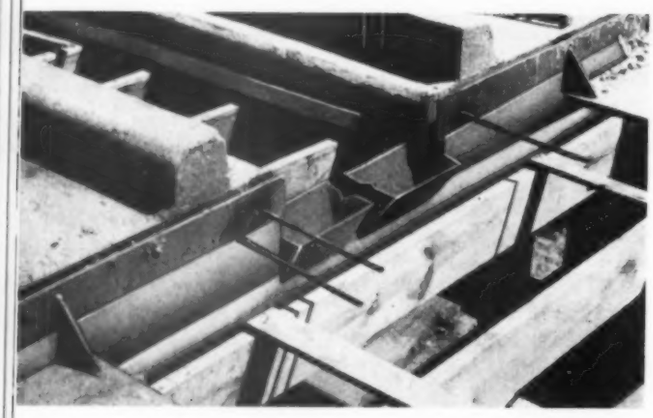
★ Raking joint clear (followed by air blast) and applying seal. Below: How wood strip is lifted from joint, and curb given final brush finish

★ Note secure anchorage and rigidity of joint assembly, consisting of patented wedge-set iron load transfer lugs and hard cypress expansion joint board

★ Rubberized asphalt joint sealing compound is heated in "double boiler"

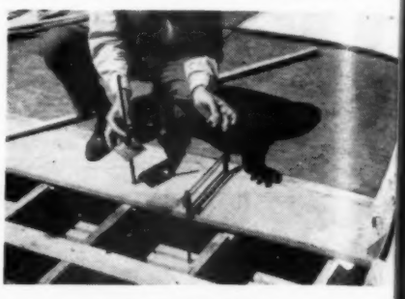


★ Houston technique to avoid uneven settlement at bridge end is to bore holes for concrete abutment footings after fill is completed, and also trench as necessary into compacted fill for abutment caps. Cap being constructed here. Backfill around caps is low strength sand-shell concrete

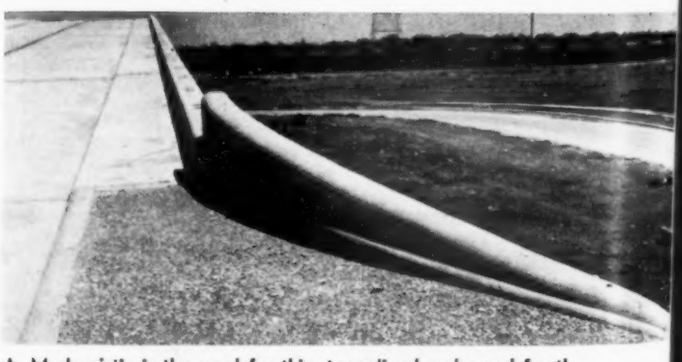


★ (Above Left, and Left): A copper "expanding bellows" gutter is placed under each expansion joint in the concrete deck—a design feature used on all overcrossings at Houston. Storm water runs down copper inlets shown, along duct, then down pipe in center of column to storm sewer

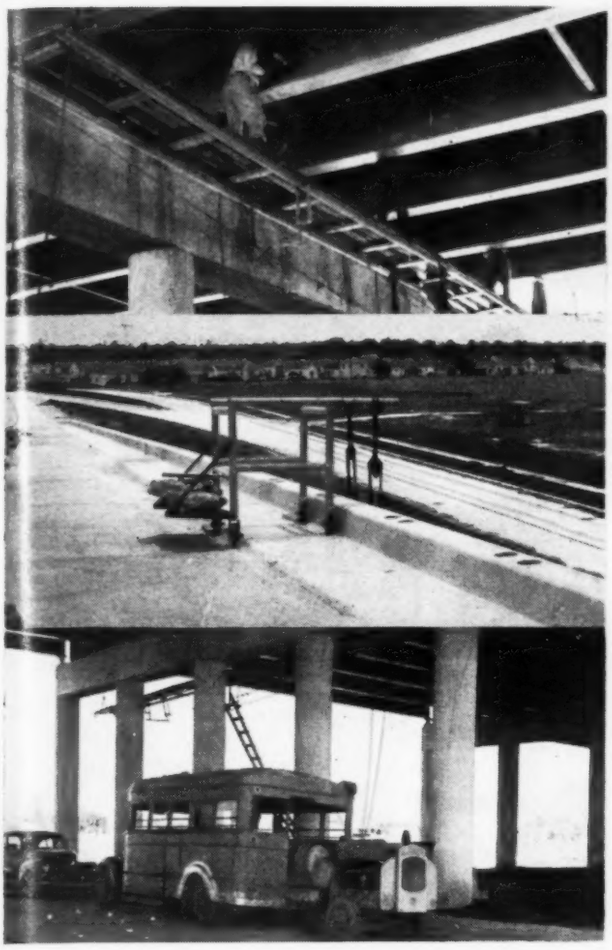
★ Right and below: Details of removable form pins, used in concreting overpass decks on Brown & Root contracts. Wire-connected screw sockets rest over tops of I-beams. Form assemblies between beams are taken down from underneath by unscrewing the bolts



★ One of six overpass structures nearing completion or under contract. Note the clean modern architectural treatment of columns and caps, which are notably slender in proportions



★ Modernistic is the word for this streamlined end panel for the guard rail of an overpass. Rail is tentatively designed to consist of two lines of flattened or oval-shaped iron pipe



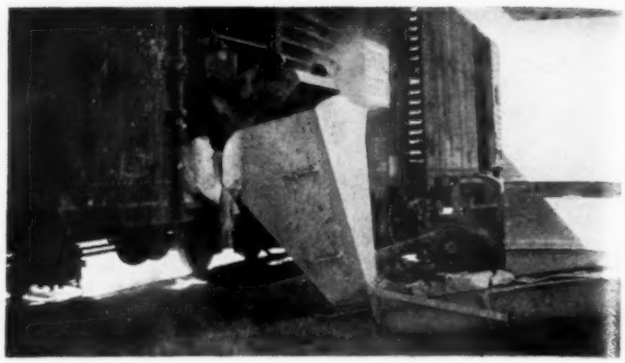
★ Scaffolding used for painting exposed deck steel. One of pair of caster-mounted support frames seen on deck. Compressor and old bus serve paint spraying crew on scaffold. Steel is shop coated with zinc chromate, spotted and burnished on completion of deck, and given final coat of aluminum paint

★ Note perfect alignment of pier columns, resulting from transit-line positioning

★ Special framing was required for extreme skew of this overpass

Striking Modern Design, Precision Forming, Characterize the Houston Structures

★ Additional views showing fruits of careful forming. Note details of expansion joint in deck, including groove under edge of parapet and along the expansion joint to block under-seepage



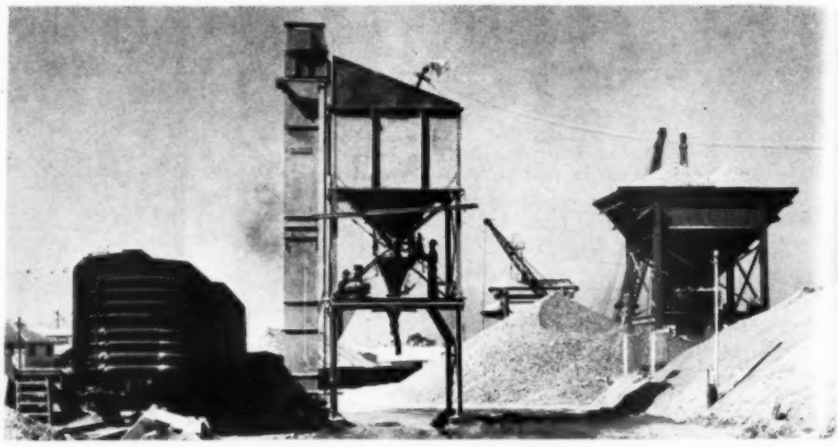
★ Cement cars were unloaded with a Butler Car Scoop, which utilized platform at back side of car for turning around

than subgrade membranes and the seal coat over base courses, indicated more uniformity and higher strengths in fill sections, where a greater proportion of the pavement foundation was compacted earth fill.

c. Moisture and density tests for a depth of 4 ft. at each load test location indicated that no appreciable change in moisture or density had occurred since construction in either base course or sub-base, in spite of the adverse weather conditions mentioned above. These data and results of load tests indicate that subgrade membranes and seal coats had functioned effectively in maintaining constant moisture and density during this period.

d. Bearing capacities (k-values) computed from elastic theory of stress distribution and results of tri-axial compression tests on the various components of the pavement structure in design tests, agreed very closely with results of plate load tests.

In addition to the above, it is planned now to extend the field load tests to include concentrated and uniformly distributed load tests on completed concrete slabs. These will be made at corner, edge and interior sections of slabs at the same locations used in the series of load tests on pavement foundation described above. Moisture and density measurements will be continued periodically for several years by coring or providing handholes in slabs, and the program of field tests described above will be continued on other sections of the expressways as construction proceeds.



★ Aggregates for concrete paving work of Brown & Root were batched at this plant, which constitutes an expansion of a permanent commercial plant (W. D. Hayden Co.). Blaw-Knox cement bin and 90-ton Johnson aggregate bins owned by contractor

Careful Pavement Finish

Attention to construction details is notably in evidence throughout the Houston project. Overpass structures have been finished to a high degree of accuracy. [Some of the refinements of procedure, such as setting of all column footing form collars with a transit, were reviewed in June '47 R&S].

In discussing the problem of details, engineer-manager W. J. Van London emphasized that details of structural and pavement finish, joint construction, etc., were worked out with particular care, and that specifications were so worded as to leave no slight detail in doubt. This was done in the belief that, while bids might be slightly higher, the effort would result in better riding, better looking and more durable pavement and structures. In inviting contractors to bid, the engineer staff called those special provisions to their atten-

★ Sprinkling compacted soil-cement layer on heavy-duty detour, part of program of serving Houston public during expressway construction. Right: As arterial cross-street traffic approaches site of overpass project, flashers (arrows) and striped panel give ample warning to slow down. Traffic is diverted around work to left, via heavy-duty hot-mix-topped "shoo-fly". R. P. Farnsworth & Co. contract

★ Transite conduit pipe used as ducts for expressway lighting system

★ Where two of the four parallel surface streets converge into one side (city-bound) of the express roadway. Note black concrete V to discourage turnarounds at junction point

tion and even went so far as to go over the items one by one with the contractors before bidding. As a result the contractors have achieved a high level of perfection in their concrete work with ordinary good inspection procedure.

Specifications require wood expansion joints at 20-ft. intervals, in conjunction with patented load transfer devices (Starr lugs). Lugs are wedged securely in place in the cypress joint board. One advantage seen in this rigid type of joint assembly is that when securely anchored it will assure a true joint.

In constructing the pavement the first concrete lift is placed using a 34-E dual-drum paver. The concrete is struck off at half depth by a special spreader board on the finishing machine. Concrete is pushed up to the joint assembly and at the same time some concrete is placed by hand on the other side of the joint to balance the pressure. Then a panel of wire mesh reinforcement is placed and the top lift of concrete spread using the same finisher with special strike-off flap lifted. Additional concrete is placed on the far side of joint by hand.

At this point the joint assembly, which is set 1-in. below the surface, is exposed and a 1½-in.-high wood strip tacked on top of the expansion board, this strip remaining until the joint is ready for edging. The finisher trowels along each side of the strip and later removes the strip, edges the joint carefully, and sees that the groove is clean.

Special care is taken to insure a clean, true joint at curb and pavement edges. Light steel plates were devised for this purpose. These plates (see photos) are set inside the curb or road form at expansion joints and act as end supports for the joint board. Plates are removed and used again after stripping the forms.

Joints are later raked clean with a hand tool, after concrete is cured, blown out with compressed air, and sealed with a rubberized asphalt compound (Paraplastic), care being taken to use no excess material but just

(*Continued on page* 78)

Equipment Used Recently on Houston Urban Expressway Contracts

Brown & Root, Inc., Equipment

3 International TD-18 tractors
4 Caterpillar D-8 tractors (3 with dozers)
1 International TD-24 tractor
3 Tampco sheepsfoot rollers
1 Huber 8-ton flatwheel roller
1 Tampco pneumatic roller
1 International 19 pneumatic tired tractor
3 12-yd. LeTourneau tournapulls
2 16-yd. Wooldridge terra cobras
2 12-yd. Caterpillar scrapers
6 No. 12 Caterpillar motor graders
1 ¾-yd. Manitowoc dragline
1 1½-yd. Lorain crane
1 Koehring 34E dual-drum paver
1 Jaeger-Lakewood finisher
2 Koehring finishers
5 Fords and Chevrolets (batch trucks)
3 Ford water trucks
6 Ford flat-bed trucks
5 Ford and Dodge pick-ups
1 Etnyre asphalt distributor
1 Buckeye gravel spreader
9 Lincoln 200 & 300 Amp. welding machines
4 Chicago Pneumatic & Gardner-Denver air compressors
1 Barber Greene ditcher

R. P. Farnsworth & Co., Equipment

4 Caterpillar D-8 tractors
3 Caterpillar D-8 bulldozers
3 No. 12 Caterpillar motor graders
1 12-yd. LeTourneau Tournapull
4 12-yd. Caterpillar scrapers
1 ¾-yd. Koehring crane
1 Huber 10-ton flat-wheel roller
1 Tampco pneumatic roller
3 Ingram sheepsfoot rollers
1 Ingersoll Rand air compressor
1 Etnyre asphalt distributor
6 GMC and Chevrolet dump trucks
2 Ford flat bed trucks
1 Auto Car water truck
1 Ford winch truck
1 Drilling and under reaming rig made by Bell Bottom Foundation Co. and mounted on International truck
1 Lincoln welding machine

Joint Finishing Details

After the finishing machine passes over a joint the joint is exposed for inspection by troweling a narrow trench along each side. The joint is checked for position by means of a string line, straightened if necessary, and additional finisher passes made as required to get a satisfactory finish. Concrete is given a few passes with a hand float and belted. Paper of cotton mat cure is specified (Siselkraft used).

★ On inspection tour of expressway: J. C. Dingwall, urban planning engineer; Frank Geron, ass't. resident engineer; L. D. Fraser, sup't. for R. P. Farnsworth & Co.; Frank Harrell, ass't. director of public works of Houston; W. J. Van London, engineer-manager, Houston urban expressway project; Jim White, Portland Cement Association; Joe Delk, senior resident engineer, Texas highway department

EDITORIAL

★ The Road Show's Biggest Lesson

If there is any one fact which stands out, now that the 1948 Road Show has come and gone, it is this: *modern equipment is more than ever a profitable investment to the contractor and the highway department.*

Construction and maintenance costs have doubled since 1940, yet the purchase price of many of the machines and the tools seen at the Road Show have not advanced more than 30% to 60% over their 1940 prices. These machines not only haven't advanced in price as rapidly as the cost of labor, but in the interim they have been bettered in efficiency—to the point where today they will pay for themselves very rapidly indeed. The machinery catalog is a bargain counter.

The contractor outfits and road and street departments you'll see out ahead in the next decade are the ones which will employ the most skill and vigor in capitalizing equipment developments.

★ Congress Gave Us All a Scare

We almost didn't get a new Federal-aid highway law! During the hectic final hours in June, when Congress remained in session far into the night to jam bills through the mill, economy-minded legislators almost succeeded in knocking out, or at least desiccating, the Federal-aid highway program. Only the valiant effort of certain committee members saved the day.

Whoever gets the credit, the fact is, we *do* have a new highway law—$450,000,000 annually for 1950 and 1951 which, with unexpended balances from the 1944 act, assures us a program well up toward the limit of present state matching ability. The wholesale stoppage of highway work, with its monkey-wrenching of contractor outfits and disruption of long-range highway planning, has been avoided. A catastrophe of sorts in our national economy has been averted. As we write this, President Truman has recalled Congress, but a special session doesn't lessen the inherent danger of the situation. The session was unforeseen. It might not have been called.

Must Shun Complacency

So—can we sit back and twiddle our thumbs? Not on your life. The only thing that will keep future congresses highway-minded is a thoroughly aroused press and motoring public. Keeping congressmen's constituents informed on the importance of road programs is a job that must go on continuously, without let-up and with constant infusion of new facts to enlighten motorists and kindle the imagination in us all. The able testimony of highway leaders before House and Senate committees this past winter normally would have assured passage of a sound bill, for no clear thinking and conscientious congressman could fail to be impressed with the highway need.

But the economy axe, wielded in wild haste as a session ends, seems to reduce congressmen to primitive creatures. Only the most impelling and politically important measures may survive.

Will there be another narrow squeak, or worse, in 1952, when Congress again takes up road matters nationally? A program that is so inherently long-range in its many aspects of planning, financing, and constructing, ought to have assurance of funds for far longer than two years into the future.

Aid Needs Doubling

Our 1948 law has many good features, including confirmation of the principle of making a "revolving fund" of unmatched or unused state balances. The new law, however, is in other ways merely an acceptable stop-gap. The next legislation must face the facts of inflation, and step up funds sufficiently to match the increased highway revenues that inevitably must be found through tax law revision in most of our states. *The Federal Highway Act of 1952 ought to projeet upwards of a billion dollars annually in federal aid for at least a five year period.*

Right now our proud road program is far below the level of best prewar years, in terms of actual construction, and hardly half of the pace needed to modernize roads as fast as a nation on wheels is wearing them out.

★ Sheepsfoot Rollers Need Standardizing

The sheepsfoot roller looks like a simple and effective tool for compacting soils. It's simple all right; but how do you know how effective it is without a yardstick? It has gotten out of hand, and some of the specifying agencies and their engineers have turned it into a theoretical plaything. Manufacturers and distributors are badly fogged-in by the multiplicity of seemingly senseless variations in design being demanded.

As was pointed out in these columns recently, the result is that a unit which ought to be an assembly-line proposition, with two or three standard models for ordinary work, is today largely tailor-made. When there are fifty models instead of a few, and new requirements coming in every day, everyone — manufacturer, distributor and contractor—has to hike his prices for making, marketing and using the unit.

While showing that this situation is not the fault of the manufacturer, we perhaps failed in our previous discussion to nail down the fact that the whole ridiculous business can be laid at the door of the engineers. We have come a long way in developing compaction into an art. Today there are numerous clear-headed individuals in soils engineering; but the entire theory and practice of getting and checking compaction is in a mess unworthy of

the civil engineering profession. Lack of agreement on a rapid means of testing compaction coupled with too much preoccupation with density rather than load-carrying capacity has created confusion. And a place where standardization is completely lacking is in the *method of getting* compaction. There is no uniform procedure in using this roller unit for given conditions. No yardstick of sheepsfoot work. If the engineers in one state highway department report that they can secure 95% relative density on Class 1 material with nine passes of a sheepsfoot roller, the data mean nothing to an engineer of a neighboring state. Why? Because he doesn't know what size or weight of rollers was used, how long the feet were, or how many feet there were per square foot, what the foot area was in square inches, or whether the feet were in line or staggered. Or, if he does obtain these data, he still knows nothing for sure, because the rollers he is familiar with are different.

While getting together on soils classification and standard tests, why not lift a lot of the fog by getting together on a few standard roller designs? Let there be two or three sizes, if really needed—something from which field effort can be calibrated and interpreted by engineers everywhere. This idea needs to be sold to all the specification writing engineers, particularly to those engineers and Bureaus whose tendencies are to specify equipment variations based upon personal desires which result in headaches for the manufacturers. Here's a committee task really worth tackling, and it ought to be put on an emergency basis, for time is a-wasting. Once the 48 states and federal agencies clarify roller design principles and resolve their differences on drum diameter, foot spacing, unit weight, etc., the individual agencies will then be able to clean up their specifications. There'll no longer be a need for "wide open" specifications such as California purposely writes in an effort not to rule out any manufacturer's product.

Let each manufacturer continue to perfect and sell his particular variations in foot design, bearings, housings, hitch, and so on. There'll still be plenty of commercial competition.

To sum up, here we have a unit that could be simplicity itself, one with no inherent gimmicks and one whose application has become universal.

Until soils engineers agree upon basic principles, i.e., whether a soil should be compacted to a certain density for density's sake or whether it should be compacted to a certain load supporting value, this question of compaction will continue to roll along in confusion. In reality, a better tool than the sheepsfoot roller may be needed; but until one is produced that can compare, economically, favorably with the resultant costs of sheepsfoot operation, let us do something about reducing the variety of types required to satisfy the varieties of specifications for compaction.

The greatest opportunity for early action on a uniform specification for rollers lies with the Highway Equipment Committee formed jointly from the American Road Builders' Association and the Highway Research Board. As it is today, no nationally-authoritative specification exists to which an engineer can refer. This committee's specification recommendations have been given serious attention in the past, although admittedly it does not represent a specification writing body. Ultimately the American Association of State Highway Officials could get together and make it official from the standpoint of the highway departments, and perhaps submit their recommendations to the American Society of Civil Engineers for consolidation into a complete recommendation on simplified sheepsfoot roller types for the whole field.

★ Township Rule a Luxury

Students of highway administration have agreed for a long time that township road administration in general is highly inefficient at best, and should have no part in modern highway planning.

The case against township road management was eloquently put recently by Professor C. C. Wiley of the University of Illinois department of civil engineering, in a report to the Illinois legislative commission on highway and traffic problems. As noted in the *Chicago Tribune*, first proof that township management has been outgrown is the trend toward larger jurisdictions. Today even some counties are too small to function properly in an integrated highway program. If a county cannot afford to hire a first-rate engineer and to purchase in large enough quantities for efficiency, how can a township hope to?

Land-service and other secondary or local roads such as fall within the jurisdiction of townships, are financed increasingly out of allocations from state gasoline or license fee revenues. The fact that tax against the abutting property has dwindled is another reason for believing that the operation of all classes of roads of a local nature should be in the hands of the county, which in turn is a direct link in a statewide effort in dovetailing with the work of the state highway department.

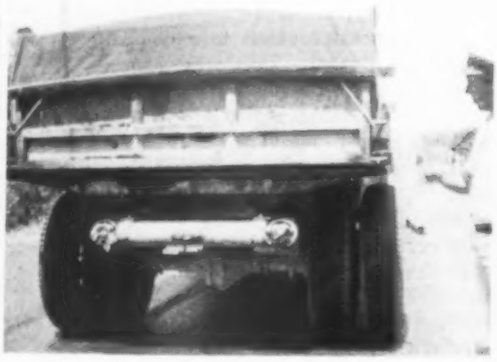
Township road officials and many citizens in the rural communities often staunchly defend township road management system. Like other highway questions, this one should not be settled on a basis of heated argument, but by first obtaining economic facts. As Professor Wiley indicates, the test is whether a township can provide reasonable highway service as efficiently as the larger jurisdiction. Who dares make a real survey and report in your state?

★ Well! Well! Ready-Mixed Concrete in Chicago

For the past 20 years, ready-mixed concrete has been sold in nearly every major city in the United States—except Chicago. Now it seems that the labor unions and other objectors have relaxed sufficiently to allow this verboten material to be used in certain southwestern and western areas of the city and some of the suburbs. Building and contracting people foresee that possibly the camel will get its nose the rest of the way in the tent one of these days.

This progress can be chalked up as a victory for air-entraining cement, the use of which is revising ideas as to when, how, how far and with what equipment concrete can be hauled during and after mixing.

No comment is needed on the fact that a metropolitan city's officials have had their hands tied for so many years on a major economic matter of this kind.



★ (Upper left): Gulf Bitulithic's modern hot-mix plant at Houston. (Upper right): Start of 44-mile run. (Lower): Showing tarp-covered trucks which held temperature drop to 5 deg. usually except for a case where the drop was 22 deg. due to a 5-hour delay over a flat tire

Hot-Mix Hauled 44 Miles for Texas Road Job

Adequate delivery temperature insured by mixing at 325-350 degrees and requiring tarpaulins thoroughly tied down over the batch loads

AN average delivery haul of 44 miles has proved no cause for worry on a current hot-mix resurface project in East Texas. The job is the widening and re-topping of a 3.78-mile section of road in the Beaumont district of the Texas highway department. Gulf Bithulithic Company, of Houston, the contractors, decided on delivery from their Houston plant after successful experience with a 29-mile haul on a central Texas project last November and December. On that job it was found that a well-covered load lost only about 10 degrees of temperature in transit. The present 44-mile haul was planned on a basis of a possible drop of only 15 degrees or a little more.

The mix being used is of three types standard in Texas, all utilizing OA 90 asphalt—sheet asphalt for leveling, 1-in.-max. binder mix, and ⅜-in.-max. surface mix. Crushed stone is used for coarse aggregate and a mixture of local field sand and stone screenings for the fine aggregate. A delivered temperature of 275-300 degrees is required.

Hauling is being done with two general types of trucks "1½-ton" Fords with 6 tons on board, and new "2½-ton" Fords with as high as 10 tons per load. The engineer requires that the load be securely covered by tarpaulins. The experience of Gulf Bithulithic Company is that contact of the wind on top of the exposed load causes far more chilling of the mix than any differential between mix temperature and outside air.

The project in question is being carried out under the direction of R. E. Killmer, district engineer, with E. D. Parmer, resident engineer.

●

The Pennsylvania department of highways in the last five fiscal years has expended in excess of $12,487,000 for acquiring right-of-way for wider highways.

Right-of-way payments have been steadily increasing since they were first allowed in 1931. During that fiscal year payments from the Motor Fund for right-of-way amounted to $3,736; last year $2,765,000.

2-Way Radio Tried by K. C. Bridge Company

The Federal Communications Commission has recently issued licenses and authorized construction companies to conduct experiments in what is known as the "Experimental Band."

ONE of numerous highway-heavy contractors actively experimenting with 2-way radio telephone is the Kansas City Bridge Co. of Kansas City, Missouri. This company's operations are scattered, taking in river work along the Missouri and Mississippi Rivers, as well as large bridge and airfield contracts in the middle-West, the South and elsewhere.

The company recently installed 2-way radio telephone units on its towboats and at its wharves and materials yards. These units consist of ultra-high frequency Walkie-Talkie type units of 150 megacycles, each carried by a man or easily portable and involving a small wet battery. The system uses an ordinary 6-volt automobile battery and weighs about 22 lb.

As with other new users of radio, the Kansas City Bridge Company personnel are experimenting with various types and makes of equipment. According to the firm's president, Alexander Maitland, it had high hopes for awhile of finding in radio a solution to the problem of maintaining sure communication between the surface and deep-water caisson work, such as was recently in progress for a deep-water pier on a highway bridge over the Missouri River near Kansas City. It is a well-known fact that any kind of wire communications between surface and ground, through bridge caissons, is liable to get out of order continually from a combination of dampness and pressure. Radio was tried experimentally on this project, but did not prove successful. Over visual paths, however, reliable communication is established up to radii of eight miles.

But for other type of construction involving only above ground operations, this organization expects to be a permanent user of radio communications.

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in all operating positions

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1. Between Blade Ends and Tires: Lots of room provided for sharp blade angles—without tire interference, front or rear.
2. Between Blade and Frame: Plenty of space here for free movement of the blade heel.
3. Between Blade Assembly and Frame Arch: More space for higher lift of the blade and better ground clearances.
4. Between Blade and Scarifier Block: Ample room for easy reversing of blade under the scarifier block.

Exceptional blade clearance is but one of the many important advantages that make Adams Motor Graders *Your Best Buy—All Ways.* Ask your local Adams dealer for complete information.

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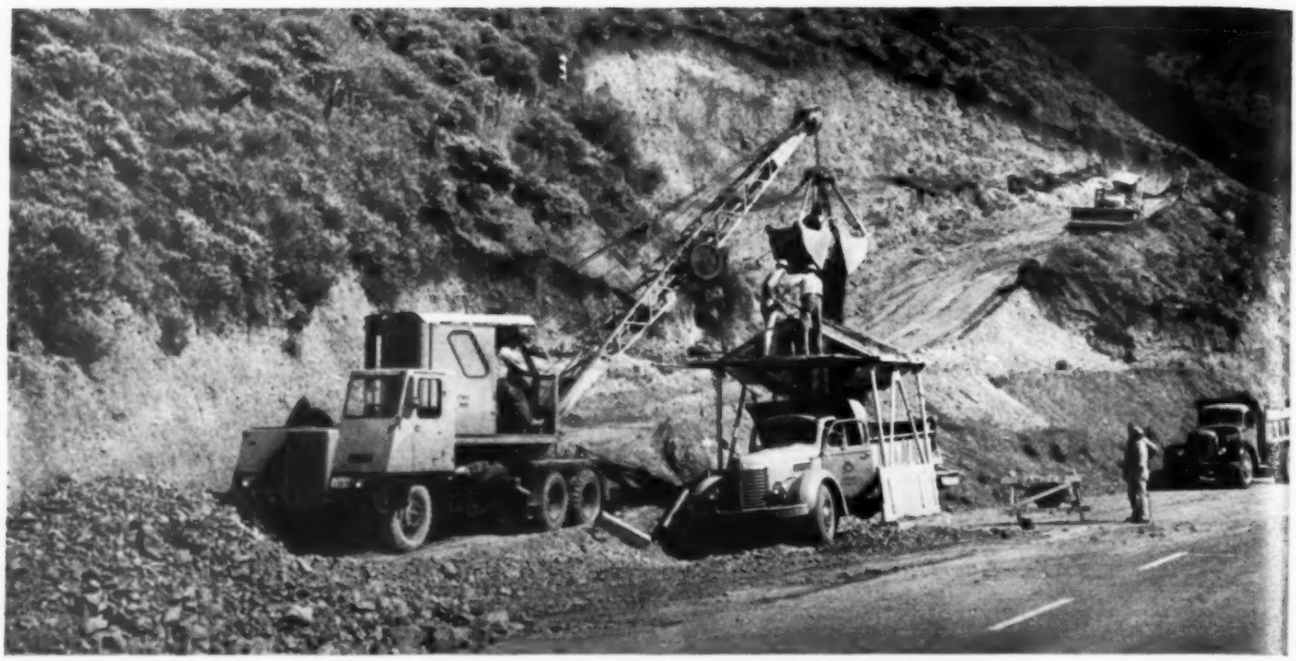
MOTOR GRADERS • LEANING WHEEL GRADERS • ELEVATING GRADERS



★ Handy outfit for temporary light pit work—a Bay City truck crane with McCaffrey clamshell is feeding material to an improvised screen mounted over a roadside truck stop. Caterpillar tractor with dozer pushing the stuff down. Truck is one of a fleet of Internationals used in California highway district No. 5

Two Local Materials

Combined for 14-Mile Road-Mix Job

California maintenance crew used improvised screen equipment and sea-side mixing "farm"

AN interesting example of local material utilization was observed this past spring in connection with road repair work on California state-sign route 1 between San Simeon and Carmel.

A leveling blanket about one inch in thickness was being put down on a 14-mile section, as part of the annual maintenance oiling program of District 5 of the division of highways. This operation is a continuation of repair work commenced last year and aimed at restoration of pavement width and riding quality lost during the war years.

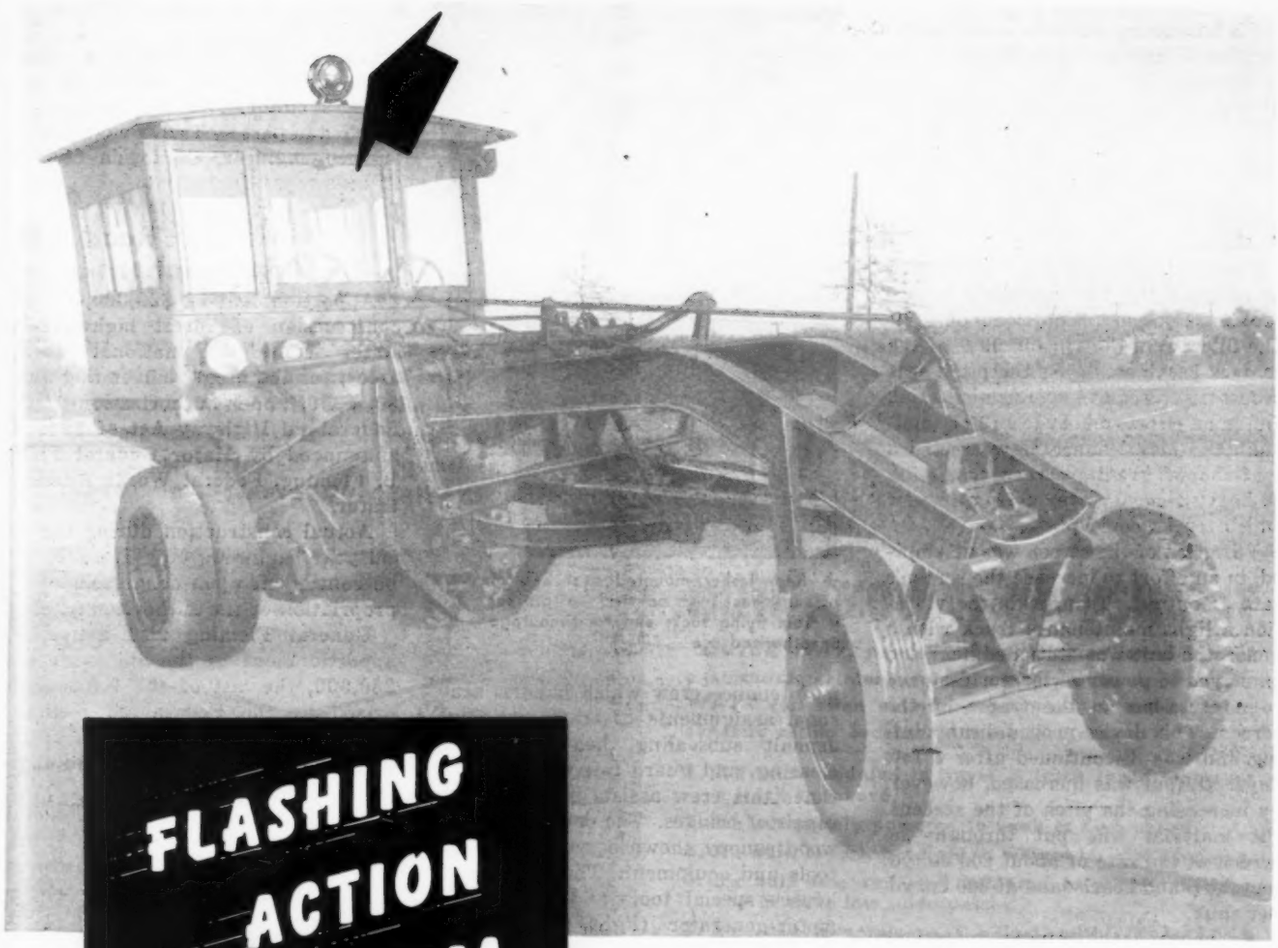
★ How the beach sand and screened pit material were blended preparatory to road-mixing SC-3 liquid asphalt for heavy maintenance blanket work. Truck is adding a 10% ratio of pit ingredient to beach sand already windrowed.

Pit and Beach

The problem was to find granular material of proper gradation for use in a road mix with SC-3 liquid asphalt. This road, which is the scenic shore route famed among tourists, is close to numerous pit sources as well as beach material. For a portion of the work a roadside pit was opened up as seen in an accompanying photograph. Near this pit was to be found an ample beach source, and also a strip of pasture land sufficiently large and level to serve as a mixing ground. Suitable mixing sites are at a premium in this mountainous area.

Both material sources were sampled

(*Continued on page* 74)



FLASHING ACTION STOPS 'EM and . . .

. only this KEYSTONE FLASHING LIGHT provides it two ways at once!

Protect your men—the public—and your equipment by installing Keystone Flashing Lights. Flashes 80 "STOP" warnings per minute to both front and rear. Completely visible thru swirling snow. Acts as a "lighthouse" to promote highway safety.

Keystone Flashing Lights have been used successfully for many years by countless cities, counties, townships, park and bridge commissions, state highway departments, contractors, public utilities, etc., on all types of vehicles. Write us to send you a light for inspection. AUTO GEAR & PARTS CO., 16th St. & Hunting Park Ave., Philadelphia 40, Pa.

KEYSTONE *FLASHING* LIGHT

"The Lighthouse of the Highway"

Specially designed for heavy duty highway service. Vibration-proof, water and dust-tight. Mounted anywhere on vehicle. Supplied with 6½ inch red lenses letter "STOP" or with plain red, amber or blue lenses, for 6 or 12 volt systems.

(*Continued from page 72*)

and a laboratory analysis made. Grading characteristics were found to be as follows:

Material	Sieve Size	% Passing
Beach Sand	⅜"	100
	#8	93
	#50	1
Filler	1½"	100
	1"	99
	¾"	94
	#4	78
	#8	70
	#200	37

From this gradation it was decided to combine the two materials in approximately the proportions of 10% fine filler from the pit and 90% of the coarser beach sand. At the pit it was necessary to remove oversize material, and in an effort to hold costs to a minimum the maintenance crew erected a roof-shaped gravity screen consisting of heavy fencing, over a frame under which trucks could pass.

Vibration of the screen was attempted, in an effort to increase the screen's rate of output. To provide the vibration a light maintenance truck with a generator unit was stationed near and employed to power a vibrator fastened to a cross-bar in the frame of the screen. This device proved disappointing and was discontinued after a few days. Output was increased, however, by increasing the pitch of the screens. Pit material was put through the screen at the rate of about 200 cu. yd. per shift, and beach sand at 600 cu. yd. per shift.

As pictured the mixing operations were performed on a piece of ground sloping from the highway down to the water. First the 90% beach sand was deposited in measured windrows. Then the 10% screened pit material was hauled in and feathered out of the tailgates as the trucks straddled the windrow in a down-hill direction. Oil was then applied and mixed, using motor graders. After material was taken to the road the field was cleaned up for reversion to pasture land.

Light Car Useful

A word is in order about the light pickup, or "express," as the California department men call it. The unit pictured is normally assigned to a special maintenance crew which handles seasonal assignments of traffic striping, asphalt subsealing, heavy roadside clearing, and guard rail painting. At times this crew assists in emergency repair of bridges. The detachable plywood canopy shown serves to protect tools and equipment. The fender box houses special tools and signs. The motor-generator (light plant), temporarily set in the truck bed and supplied by a removable gas tank, is used to operate lights, saws, drills and grinders. On this job it was used to power the vibrator on the screen.

★ Red flasher mounted over cab of pick-up was kept covered to protect it from flying rocks and to discourage unauthorized use

The availability of such a lightweight, versatile unit opens up all kinds of possibilities for improvising methods of getting things done economically and with dispatch.

Note that a two-way flasher unit is mounted on the cab roof, and protected with a heavy cloth cover. This cover serves not only to shield the flasher from breakage when around flying stone particles, but also discourages unauthorized use of the red flasher lights, which are mainly for use in connection with traffic striping on busy highways.

The photos accompanying these notes were taken by the ROADS AND STREETS editor, and the information supplied in part by T. H. Dennis, maintenance engineer, California division of highways, Sacramento.

New Forest Road Appropriations

Apportionment of $20,000,000 for construction of forest highways in states containing national forest areas, for the fiscal year ending June 30, 1950, under authorization of the Federal-aid Highway Act of 1948, is announced by Major General Philip B. Fleming, Federal Works Administrator.

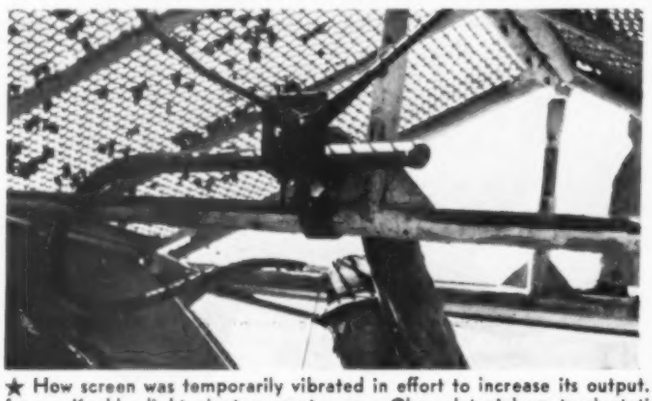
Actual construction during the fiscal year beginning July 1, 1949, will be contingent upon congressional appropriation of the authorized amount.

General Fleming also announced apportionment to the states of $6,250,000, the last of the funds authorized by the Federal-aid Highway Act of 1944 for improvements on the primary and secondary Federal-aid systems.

In apportioning the 1948 Federal-aid funds on May 12, 1947, 5% was retained to permit any adjustments that might be required by pending legislation. The Federal-aid Highway Act of 1948, approved June 29, increases the fund for administration and research from 2½ to 3¾ % of the total authorized appropriation, and makes the increased rate applicable to the 1948 funds. The $6,250,000 is from this source.

Apportionment of forest highway funds and Federal-aid funds by states is as follows:

Larger individual combined apportionments include $3,230,000 for California, $2,847,000 for Oregon, $2,100,000 for Idaho, $1,500,000 for Alaska, $1,698,000 for Montana, $1,538,000 for Colorado, $1,388,000 for Washington, and $1,216,000 for Arizona.



★ How screen was temporarily vibrated in effort to increase its output. Vibrator unit fasted thusly was powered from a Koehler light plant generator on a Chevrolet pick-up truck stationed alongside. Raising pitch of screen proved more successful

"QUICK-WAY"

REG. U. S. PAT. OFF.

YOU KNOW IT BY NAME;

You know the *name*, "QUICK-WAY", by far the oldest in the production of truck mounted power shovels. All over the world truck shovels and truck cranes are quite commonly known as "QUICK-WAYS" regardless of who made them, because "QUICK-WAYS" set the standard.

NOW KNOW IT BY USING IT

"QUICK-WAY" stands for the *quick way* to and through a job, *quick* maintenance, and *quick* profits. A "QUICK-WAY" can often outwork equipment of much higher capacity rating because of these features.

1. **It's truck mounted to travel at truck speed wherever a truck can move.**
2. **It's adequately powered to work at high speed.**
3. **It's built to last, but light in weight for fuel economy.**
4. **It's built low and well balanced to prevent tipping and to clear low underpasses.**
5. **It's easy to service and adjust, with simple interchangeable parts.**
6. **It's versatile, with attachments that convert *in minutes* from shovel to crane, clamshell, dragline, pile driver, scoop, trench-hoe or backfiller, eight in all.**
7. **It's quick to pay for itself, with low first cost and low upkeep.**

—All facts you can prove through personal experience. No matter what other equipment you own, you need "QUICK-WAYS" too. There's a "QUICK-WAY" distributor near you with sales and service readily available.

Service available from Distributors strategically located throughout the U. S. and worldwide.

Model E 4 10 cu yd. cap., mounts on standard. 5-ton truck.

Model J. 1 4 cu. yd cap., mounts on standard 1 1/2-ton truck.

"QUICK-WAY"

For speed, portability, economy of operation, and adaptability to a wider range of jobs, nothing of comparable size equals a "Quick-Way" Truck Shovel.

"QUICK-WAY" TRUCK SHOVEL CO.

DENVER, COLORADO

★ Several types of trucks were used to haul gravel on runs ranging up to ten or fifteen miles, in hauling material from an airport reconstruction site to the shouldering operations. An International truck with Dump-crete body and a truck with Heil body are pictured

Mechanized Shoulder Crew

Performs Fast Graveling Job in Arkansas

MAINTENANCE men in the Arkansas highway department know from experience that there is only one answer for shoulders along an arterial highway when traffic reaches a certain volume. The answer is gravel. Gravel or some other kind of shoulder improvement is especially needed where many trucks use an ordinary 18 or 20-ft. roadway.

As funds permit, the Arkansas force has tried various uses of local material to improve shoulders. One example of rather extensive improvement was seen recently along U.S. 67 northeast of Little Rock. Gravel made available cheaply as spoil during reconstruction of a local airport, was being spread at a depth of 5 in. and a width of 6 ft. after trenching out the clay material. This is quite an ordinary operation, but as the Arkansas force performed it, it affords an excellent example of the degree of mechanization that is taking place on highway maintenance everywhere today. A motor grader, a fleet of dump trucks, and a straw boss were able to complete many hundreds of feet per day.

According to word from C. C. White, state maintenance engineer, the Arkansas highway department has inaugurated an extensive program for the maintenance and stabilization of

(*Continued on page* 111)

★ Showing the successive passes made by an Austin-Western motor grader in spreading gravel in trench recently bladed out of the clay. Clay is used to widen the shoulder where necessary

GALION 102
MOTOR GRADER

FRONT *Same Size Tires* REAR

Both ends of a Motor Grader are important--that's why on the GALION 102 all six wheels and tires are the same size.

Better Performance Because—

- More ground contact and larger anti-skid tread gives greater stability for all operations of the grader.
- Decreases front end slippage on bank or shoulder work.
- Better flotation on soft material.
- Economy and convenience of a single tire size.
- Less shock and wear on machine and operator.
- Permits faster speed when traveling.
- Moves more material with less power.

Write for Catalog No. 290

THE GALION IRON WORKS & MFG. CO.
General and Export Offices
Galion, Ohio, U. S. A.

GALION Estab. 1907

GRADERS · ROLLERS

Progress on Expressway Construction

(*Continued from page 67*)

neatly fill the groove.

Curbs of rolled design are finished by simple but effective hand methods which involve placing curb-shaped steel template plates on the forms at 5-ft. intervals and drawing a short longitudinal straightedge over the template plates.

Curved curb returns, odd sections of pavement, special traffic dividers and other tricky details abound on an expressway project. It goes without saying that a contractor who hasn't a good concrete crew is his own worst enemy. The Brown & Root and the Farnsworth organizations on the present Houston contracts have both come through with fine work with minimum inspection worries. Brown & Root also has shown very good speed on the longer straightaway stretches of expressway paving, placing and finishing as high as 500 cu. yd. per day with 34-E dual drum paver.

Heavy Duty Detours

The problem of detouring arterial traffic through expressway work is an important one. In Houston two "shoo-fly" detours 1200 and 1900 ft. in length have been built at a cost of $30,000. Traffic as high as 33,000 daily is carried at a cost computed at approximately one cent per vehicle for a 70 to 90-day period—a price considered thoroughly justified in view of the public service performed. The heavy-duty roadway built for this brief use is 40 ft. wide and consists of 14 in. of sand-oyster shell flexible base course, the top 4 in. being plant mixed with 3 bags of cement per cu. yd. and 1½ in. of hot-mixed asphaltic concrete topping.

Farnsworth Making Speed

After having completed $1,300,000 a contract for storm sewers along one 2.2-mile section, R. P. Farnsworth & Co. was awarded contract No. 6 early this year, involving two overpasses and related roadway, etc. Working through Bell Bottom Foundation Co. as sub-contractor, a 7-column pier bent was put down 17 to 20 ft. to foundation level per working day for the Wayside crossing. Power-operated auger and under-reamer equipment was employed.

Although overshadowed in interest by the paving and structural work, all the contract sections of Project I have involved large yardages of earth-moving. And the stiff clay has been plenty tough, hardening in a few hours' exposure to air until a mallet blow will barely break off a rolled-up chunk.

Brown & Root was doing clean-up and ramp grading along two contracts this spring, using a mixed outfit consisting of 3 D-8 Caterpillar tractors, 1 Wooldridge Terra Cobra (16 yd.), 1 Super C Tournapull (12 yd.), and two draglines loading miscellaneous trucks (Manitowoc and Insley).

W. J. Van London is engineer-manager of the Houston urban expressways, under the Texas highway department, D. C. Greer state highway engineer.

ALLIS-CHALMERS SPECIFIES...
Velvetouch ALL-METAL
STEERING CLUTCH FACINGS
ON THE NEW HD-19
Velvetouch cone clutch linings are also standard on Gar-Wood Models CU-1 and CU-2 cable control units.
Steering clutch disc for HD-19.
THE S. K. WELLMAN CO.
WAREHOUSING CENTERS
ATLANTA ..... 119 14th St. N.E.
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DALLAS ..... 3407 Main St.
LOS ANGELES ..... 1110 S. Hope St.
PHILADELPHIA ..... 97 E. Montana St.
PORTLAND ..... 636 N.W. 16th Ave.
SAN FRANCISCO ..... 424 Bryant St.
TORONTO, ONTARIO, CANADA.
The S. K. Wellman Co. of Canada, Ltd. ..... 197 Laird Dr.
Like other leading manufacturers of heavy duty tractors and earthmoving equipment, Allis-Chalmers specifies Velvetouch for dependable power control. Because the powdered metals, used in making Velvetouch clutch facings and brake linings, are scientifically processed to minimize chattering and slipping . . . insure smooth, positive action. Genuine Velvetouch lasts longer, too . . . for it's all-metal . . . can't rot in oil or "burn" like conventional material. Send for descriptive literature today.
THE S. K. WELLMAN CO.
1374 East 51st St., Cleveland 3, Ohio
FOR BRAKE AND CLUTCH USE Velvetouch
WORLD'S LARGEST MANUFACTURERS OF ALL-METAL CLUTCH FACINGS AND BRAKE LININGS

Pennsylvania Has Record Year

Expenditures of $122,265,740 were made by the Pennsylvania department of highways in the fiscal year that ended May 31, Ray F. Smock, secretary, reported. That sum was the largest outlay of money in any fiscal year in the department's history. It is approximately 40% above 1946-47. The record breaking $73,534,435 was spent for construction, reconstruction, resurfacing and widening on the 41,000-mile state highway system.

Maintenance costs for the last fiscal year amounted to $26,612,951, a slight drop. Snow removal accounted for $7,262,266.

NEW IMPROVEMENTS in GarWood HEAVY DUTY DUMP BODIES and HOISTS

NOW MORE RUGGED THAN EVER

Important improvements in both design and construction make Gar Wood Heavy Duty Dump Bodies and Hoists even more profitable for the contractor than in the past. These improvements mean better performance . . . longer life . . . less maintenance.

BETTER PERFORMANCE

The new nested type welded understructure provides maximum strength with minimum weight and reduces mounting height . . . also eliminates floor plate sag. The heavily reinforced rear corner posts and rugged rear end construction provides extra strength where it is needed the most.

Gar Wood Heavy Duty Cam and Roller Hoists have been strengthened through the use of alloy steel crossheads. The cams have been placed on the outside of the tracks to provide maximum stability.

For the *many other advantages* of Gar Wood Heavy Duty Dump Bodies and Hoists, see *new* Bulletin HB-302. Ask your dealer for a copy or write directly to factory.

When profits are important . . . Gar Wood Hoists and Bodies are preferred

GAR WOOD GW INDUSTRIES

GAR WOOD INDUSTRIES, INC.

WAYNE DIVISION, WAYNE, MICHIGAN

PRODUCTS—HOISTS • DUMP BODIES • WINCHES • CRANES • TANKS • TRACTOR EQUIPMENT

DITCHERS • SHOVELS • FINEGRADERS • SPREADERS • TRUCK PATROLS

PERFECTION

Is the Name to Remember when you want... **UTMOST SERVICEABILITY** IN **BODIES** AND **HOISTS**

Photo shows a PERFECTION No. 154 (4½ yd. capacity) Dump Body with a No. 715 Hydraulic Hoist. PERFECTION Bodies... are made in many styles and any practicable capacities to meet your needs. Write for complete information.

THE PERFECTION STEEL BODY COMPANY
Galion, Ohio, U. S. A.

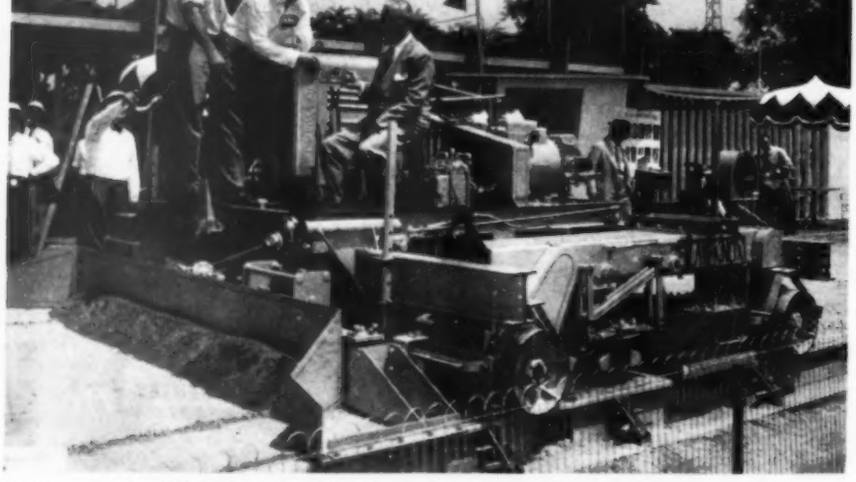
PERFECTION STAKE and DUMP BODIES HYDRAULIC HOISTS — **FOR ANY TRUCK** STANDARD or SPECIAL UNITS IN ALL SIZES • FOR ANY USE

Road Show

(*Continued from page* 57)

The product show was only the more visible half of this 9-day affair. Indoors, in a series of meetings, the tremendous need for getting on with the nation's road program was told in figures that, to many a sober analyst, make Needs a far more urgent subject than Methods. Maj. General Philip B. Fleming, federal works administrator, traced the part equipment has played in making possible the miracle of our present road system in three decades.

Whereas simple 2-lane roads used to suffice, now streamlined 4, 6 and 8-lane expressways are needed near and through centers of congestion. Such roads, built with the many refinements in design and construction now deemed necessary, would be impossible without the cost-saving and time-saving machines developed in the interim. "With vehicle registration approaching 40,000,000 (expected by year's end), we must build not only more and better highways, but we must build them faster," warned General Fleming, who continued—(italics are ours)—"*of the millions of vehicles making daily use of the highways, by far the greater part are engaged in essential or useful service—service to business, industry, family. When a large part of highway movement is delayed and endangered by highway congestion and deficiencies of construction, there is a great economic waste. The nation cannot permit its highways to deteriorate while the demand for highway service grows by leaps and bounds. The situation calls for bold planning and prompt action.*"



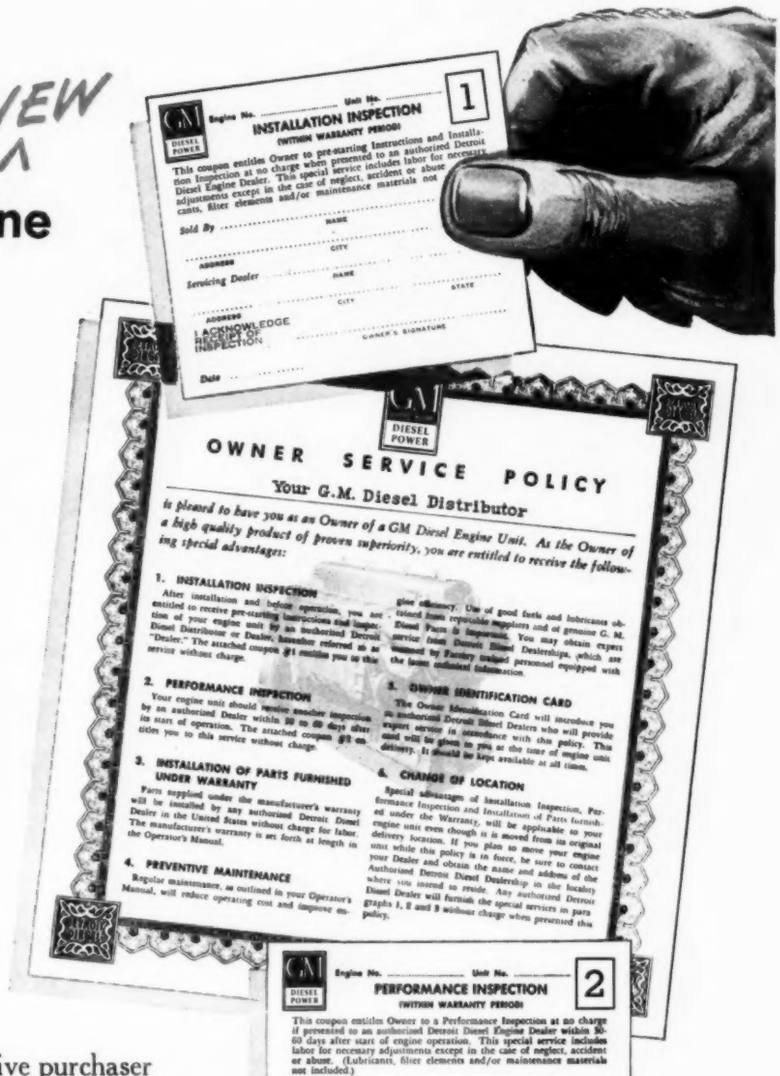
★ Gov. Green of Illinois, road-minded Governor, learns how easy it is to build roads on the Blaw-Knox finishing machine while visiting the Road Show in Chicago

General Fleming further declared that the physical volume of highway work has declined, although costs have doubled since 1940. Shortages and delays have forced contractors to include contingencies in their bids, with the result that highway officials have delayed all but high-priority projects. Omitting two large bridges, construction contracts awarded by the highway departments for the first five months of 1948 total $425,000,000 for

(*Continued on page* 84)

YOU GET 3 Big Service Extras

—when you buy a NEW GM "71" Diesel Engine



1. *Installation Inspection:*

The GM Diesel representative inspects and checks the engine without cost to the owner; whenever possible this is done before the engine is put to work. He explains how to successfully operate the engine and the "preventive maintenance" necessary for best results in days to come.

2. *Performance Inspection:*

From thirty to sixty days after the engine has begun its job, another inspection is provided without charge. The GM Diesel representative makes any adjustments that may be required and tunes up the engine to its best performance.

3. *Owner's Service Policy:*

Besides the above inspections, GM Diesel owners are protected by an exceptional warranty outlined in the owner's service policy.

WE WANT every purchaser or prospective purchaser of one of our engines to know how his local distributor and dealer, with their factory-trained servicemen, stand back of the product. They in turn are backed by the knowledge that Detroit Diesel supports them strongly in their adherence to this policy.

GM
GENERAL MOTORS
DIESEL POWER

DETROIT DIESEL ENGINE DIVISION

SINGLE ENGINES.. Up to 200 H.P. **DETROIT 28, MICHIGAN** MULTIPLE UNITS.. Up to 800 H.P.

GENERAL MOTORS

HELP AMERICA PRODUCE FOR PEACE
Turn in SCRAP

DIESEL BRAWN WITHOUT THE BULK

As Far Ahead in Ease o
and Servicing as in P

SIMPLIFIED SERVICING

All adjustments are unusually accessible.

All fittings or lubrication points readily reached — none under tractor. Draining transmission final drives and engine crank case are the only operations which need to be done from beneath the tractor.

Types of oils and greases needed are cut to a minimum.

ONLY 3 LUBRICATION PERIODS
No daily lubrication necessary:

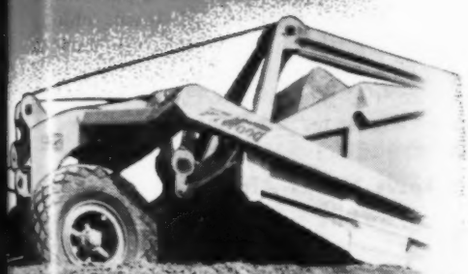
AT 75 HOURS —drain engine oil.
. . . change lubricating oil filter elements.
. . . check final drive, transmission and hydraulic steering.
. . . only 3 grease fittings: 2 on torque converter; 1 on engine clutch release.

AT 200 HOURS —drop oil in cups of starter and generator. 4 fittings; fan, fan belt idler and universal joints.

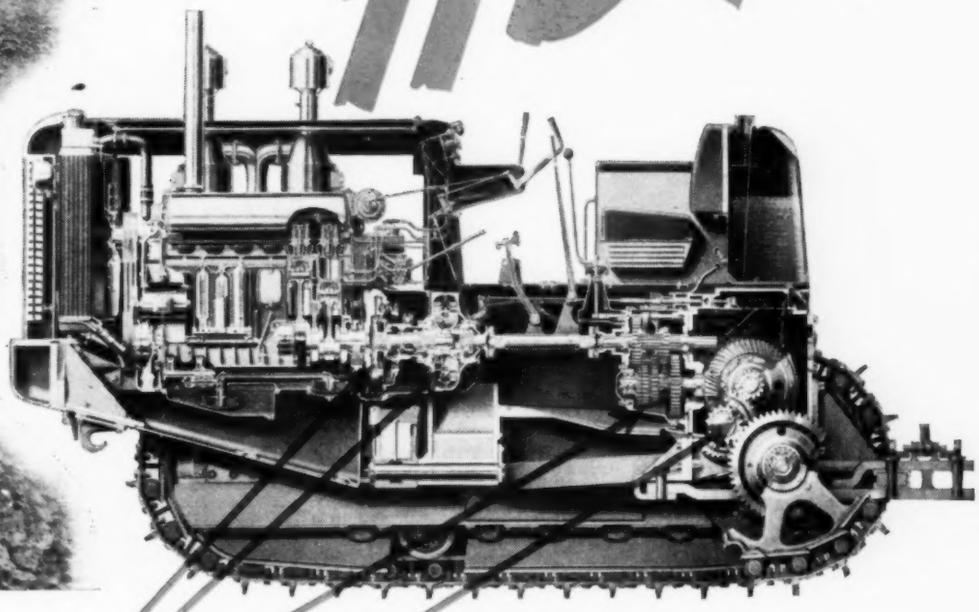
AT 1,000 HOURS —change oil in transmission and final drive.
. . . lubricate truck wheels, track idlers and support rollers.

FASTER, EASIER SERVICING, MEANS LESS "DOWN TIME". . . LESS COST . . . HIGHER OUTPUT. *SIMPLIFIED MAINTENANCE MEANS BETTER MAINTENANCE, TOO!*

# of Maintenance Performance!..



Allis-Chalmers HD-19



REPAIRS EASILY ACCOMPLISHED

No need to remove unrelated parts to reach units needing attention.

Engine clutch and torque converter can be removed without disturbing engine or transmission — transmission assembly removable without disturbing engine, clutch or bevel gear.

Each steering clutch removable independently of final drive or bevel gear.

Special tools cut to minimum.

Complete stocks of replacement parts—made in same factory to same exacting specifications as are on original tractor—are carried by Allis-Chalmers dealers.

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

★ ORIGINATOR OF THE TORQUE CONVERTER TRACTOR

More... and more... Briggs & Stratton Engines ... every day

For several years, despite record production, it has been impossible for us to keep up with the rapidly increasing demand for more and more Briggs & Stratton gasoline engines. Now, however, more equipment and appliances than ever before are being powered with Briggs & Stratton engines.

Many models are now available for replacement or auxiliary power. See them on display at your nearest Briggs & Stratton Authorized Service Station or dealer.

BRIGGS & STRATTON CORPORATION
Milwaukee 1, Wis., U. S. A.

Road Show

(*Continued from page* 80)

17,679 miles of roadway. This compares with $522,000,000 expended during the whole year of 1940, for 32,594 miles, showing the dwindling value of the dollar and shrinkage of our actual program in terms of roadway miles.

Two cheerful factors noted by the General are a leveling of prices, and a return to a plentiful supply of certain scarce items of construction. Meantime, he urged that, with labor prices still rising, contractors make fullest use of machinery and use materials that require least on-job labor.

Increased road funds were urged by no less a personage than representative Paul Cunningham, of Iowa, chairman of the House subcommittee on roads. He revealed in his talk that he would soon introduce a bill in congress calling for more than the present $450,000,000 annual federal-aid program. He called attention to the present serious lack of uniformity of road development.

Airport Needs Aired

Phillip Moore, chief, airport division, Civil Aeronautics Administration, spoke briefly on CAA's activities. Jennings Randolph, president of ARBA's airport division, said that the civil airport program has accelerated until last month alone over 100 applications for projects were received. He said not to be discouraged at the seeming slowness of the airport program in its early stages, but to recall the early slowness of the road program. In planning an airfield, he emphasized, it should be planned not as just a strip of ground out on the fringe of a community, but as a community center.

Contractor Group Meets

Among the topics aired at the Contractor's Division meetings was that of gross weights on highways. A committee report by chairman S. J. Mahaffey told of progress, through meetings with PRA officials. He noted the undertaking of a ton-mile hauling study on sections of the Pennsylvania Turnpike vs. a nearby road of less modern design. On behalf of contractors who must move heavy equipment to their jobs, he reported conferring with H. S. Fairbank of PRA. It was recommended that a committee representing the engineering, contractors and manufacturers divisions of ARBA employ an engineer to compile size and weight data on equipment being planned by manufacturers (also on trailers), to aid in the design of equipment that will meet regulations and be quickly dissembled and assembled. Early consideration of this important matter was recommended, so that the states will not set arbitrary gross weight limits that will handicap the movement of road building equipment.

Strong County Meetings

The County Highway Officials division's sessions included pleas for proper attention to rural highway development, by Ben T. Collier, president of the division, B. A. Winquest of the National Rural Letter Carriers Association, and A. J. Thelen of the American Institute of Local Highway Administration. The 800,000 increase in U.S. farm population since 1932 has focused attention on the disrepair of many of our farm-to-market roads, said Winquest. Farmers are the biggest single class of road users, and their motor travel is "78% essential." Over 1,400,000 miles of rural roads are still dirt, and often impassable in wet weather.

County roads, particularly farm-market roads, must be designed to varying standards governed by economic and financing factors and availability of local materials, said other speakers. Design committee chairman W. M. Biays, citing Kansas experience, recommended H10 loading for farm-market road bridges instead of H15 where per-

(*Continued on page* 109)

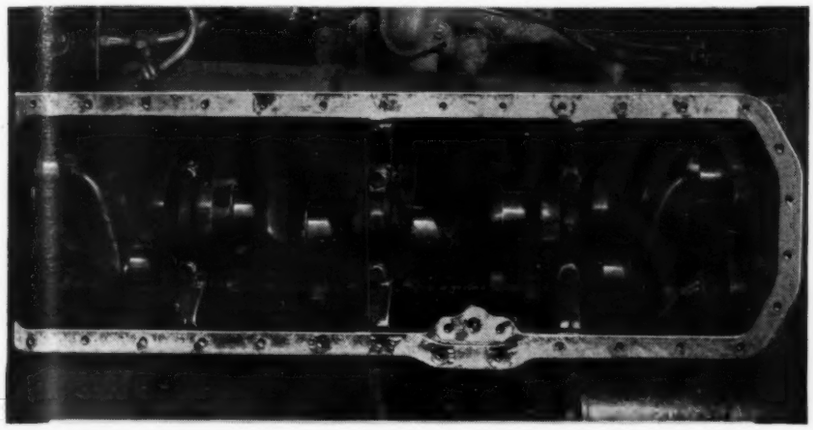
STANDARD ENGINEER'S REPORT

RPM CALOL

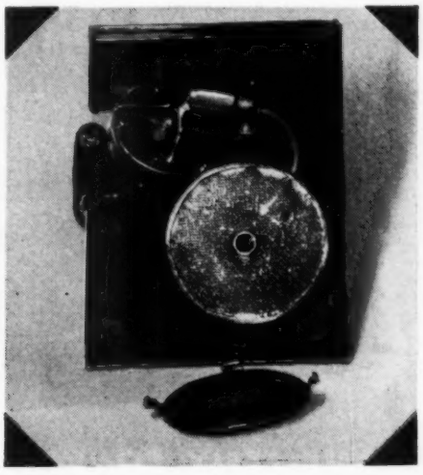
TEST DATA

UNIT	8 Cyl. High Compression Bus Engine
LUBRICANT	RPM Heavy Duty Motor Oil SAE 30
MILES RUN	90,371
CONDITIONS	Highway Operation - Below freezing to desert heat
FIRM	Moyers Stages
LOCATION	Fresno, Calif.

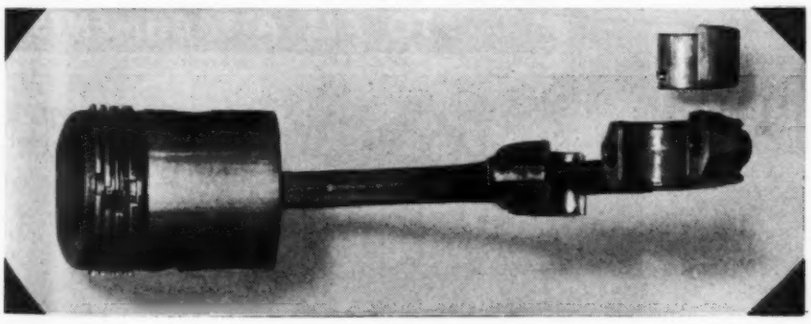
GASOLINE BUS ENGINE RUNS 90,371 MILES IN CLIMATIC EXTREMES WITHOUT SLUDGE OR CARBON TROUBLE



This bus engine was torn down after operating in regular highway service for 90,371 miles on RPM Heavy Duty Motor Oil ... average speed, 50 M.P.H. with many starts and stops. Inland valley weather conditions - below freezing in winter to more than 100° F. above zero in the shade in summer. As the photograph shows, the inside of the engine was exceptionally clean. RPM Heavy Duty Motor Oil's special detergent compounding keeps all engine parts cleaner.



The oil-pump screen was clear and no deposits had accumulated in the crankcase pan. With RPM Heavy Duty Motor Oil, any lacquer, carbon, sludge or other foreign matter is dispersed in the oil and flows out when the crankcase is drained.



All rings were free and bearings in good condition as indicated by this piston and connecting rod from the engine. RPM Heavy Duty Motor Oil loosens and removes lacquer and carbon from around rings -- keeps oil return holes open and deposits from building up in grooves. It is not corrosive to any bearing metal.

REMARKS: RPM Heavy Duty Motor Oil SAE 30 was in this engine from the time the engine was new and first put in service. The crankcase was drained at regular intervals. Special compounds in RPM Heavy Duty Motor Oil give it the ability to keep engines clean, adhere to both hot and cold spots in engines, resist oxidation, prevent corrosion and foaming.

STANDARD TECHNICAL SERVICE conducted and reported this test: If you have a lubrication or fuel problem, your Standard Fuel and Lubricant Engineer or Representative will give you expert help; or write Standard of California, 225 Bush Street, San Francisco 20.

STANDARD OF CALIFORNIA • San Francisco, Calif. | STANDARD OIL COMPANY OF TEXAS • El Paso, Texas
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New

UNIT 1520

Self-Propelled

RUBBER-TIRED CRANE

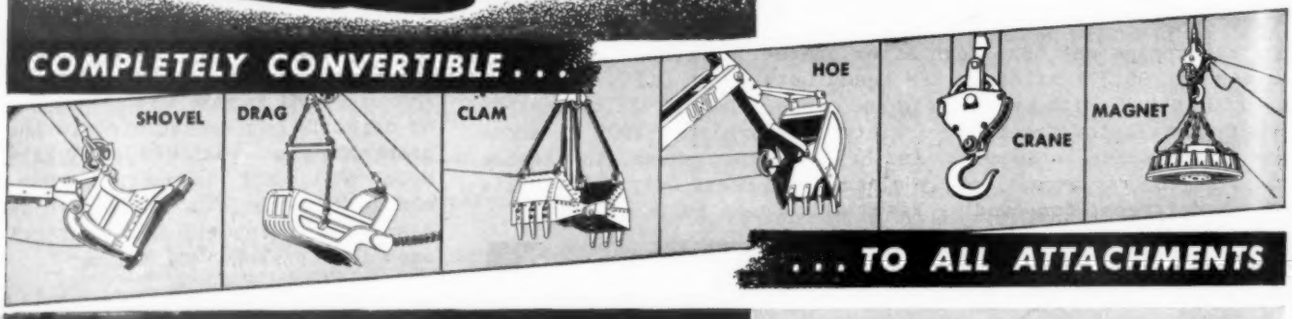
15 TON CAPACITY

This 50,000 pound Mobile Crane is a completely new member of the UNIT Crane and Shovel line. Designed for both "on and off" highway operation. So compact, it works efficiently even in small, cramped quarters, "in or out" of the yard.

- **Rugged . . . Perfectly Balanced**
- **Hook Roller Construction**
- **Controlled and Operated by ONE Man**
- **Powered by ONE Engine**
- **Hydraulic Steering . . . Air Brakes and 4 Speed Air-Actuated Transmission**
- **Heavy Duty, yet operated with remarkable SPEED . . . SAFETY . . . ACCURACY . . . ECONOMY!**

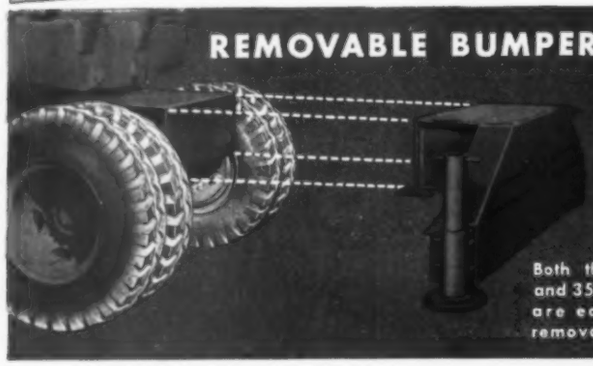
UNIT CRANE & SHOVEL CORP.
6407 W. BURNHAM STREET
MILWAUKEE 14, WISCONSIN, U. S. A.

COMPLETELY CONVERTIBLE . . .



. . . TO ALL ATTACHMENTS

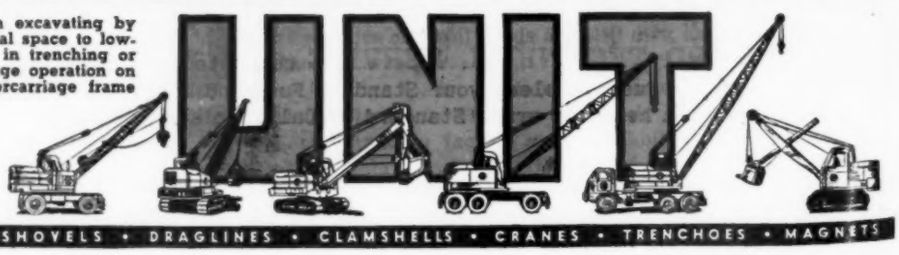
REMOVABLE BUMPERS



Both the UNIT 1520 and 357 Mobile Crane are equipped with removable bumpers.

Greater digging efficiency is attained in excavating by removal of one bumper. Permits additional space to lower boom, thus increasing digging depth in trenching or other excavating jobs. Provides close-range operation on shovel work. Bumper is bolted to undercarriage frame and its removal is a simple operation.

CONTACT FACTORY DIRECT FOR PRICE AND DELIVERY
or See Your Dealer.



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How Minneapolis Does Its

Snow Plowing

129-machine fleet clears entire street mileage after each storm, loads and hauls from 100 miles. Staff experimenting with equipment refinements. Rotary unit now used on bridges

By Hugo G. Erickson
Assistant City Engineer, City of Minneapolis

IN most respects, the winter of 1947-48 was an average season in regard to snow conditions in the City of Minneapolis. There were eight snow falls varying from 2 to 9 in. per storm. A total of 48.8 in. fell, as compared to the yearly average of 41 in. One deviation from normal, and a serious one, was that the majority of the storms occurred over weekends, necessitating paying a large number of the personnel employed on snow removal, time and a half for Saturdays and double time for Sundays. This additional expense imposed a considerable strain on an already tight budget.

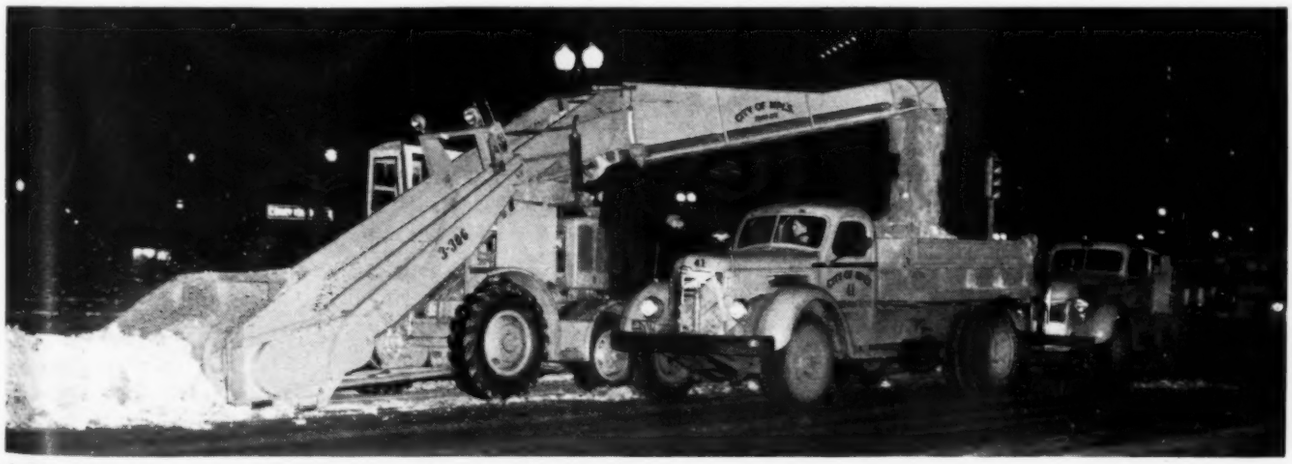
All Streets Plowed

Minneapolis has about 1,000 miles of streets, all of which were plowed after each snowstorm. In addition, snow was loaded and hauled away from about 100 miles of streets. Following a snowfall of 5 in., the plowing operation was usually completed in 12 hours; following a 9-in. storm, in 18 hours. The clean-up, including loading and disposal of snow, extended over 10 to 14 days after each storm. Including overtime payments, the total cost of plowing and snow removal averaged $45,000 for the 5-in. snowstorms and $70,000 for the 9-in. snowfall. The base pay for common labor was $1.30 per hour and for machine operators $1.65 to $1.85 per hour.

For the plowing operation, the Minneapolis city engineer's department utilized 97 trucks, all city-owned, varying in size from 2½ ton to 5-ton. Trucks were equipped with fixed-angle, one-way snowplows. Some of the plows used were designed and built by city personnel. These snowplows differ somewhat from the conventional commercial types in that they have cutting edges held in place by springs which will trip when they hit a protruding solid object such as a streetcar rail or a manhole. To further reduce the wear and tear on plows, vehicles, and street surfaces, the plows are supported and ride on two-wheel casters. The hook-up of the plow to the truck enables the snowplow to be attached or detached in a matter of about five minutes. Snowplow blades vary in lengths of from 9 to 10 ft. and are 30 in. high, and weigh from 900 to 1000 lb. without the truck hook-up.

Numerous Motor Patrols

In addition to the trucks, 19 large diesel-power, tandem-driven motor patrols were used last winter for snowplowing. During the 1947-48 season the standard blade or mold-board of the patrol was adequate for the amount of snow that fell. Considerable experimental work was carried on, however, during the season, with a



★ This Barber-Greene loader has seen two winters' breaking in

★ One way to get rid of snow—a new Snow Master (Iowa Mfg.)

★ Another rotary (Bros) on night loading in Minneapolis

city-designed and constructed snowplow for use when snow exceeds 14 in. in depth. This experimental plow is 12 ft. long and 42 in. high, has a trip cutting edge, is supported on casters, and is mounted on the front end of the patrol graders. Preliminary tests indicate that this equipment will work very well in heavy snow.

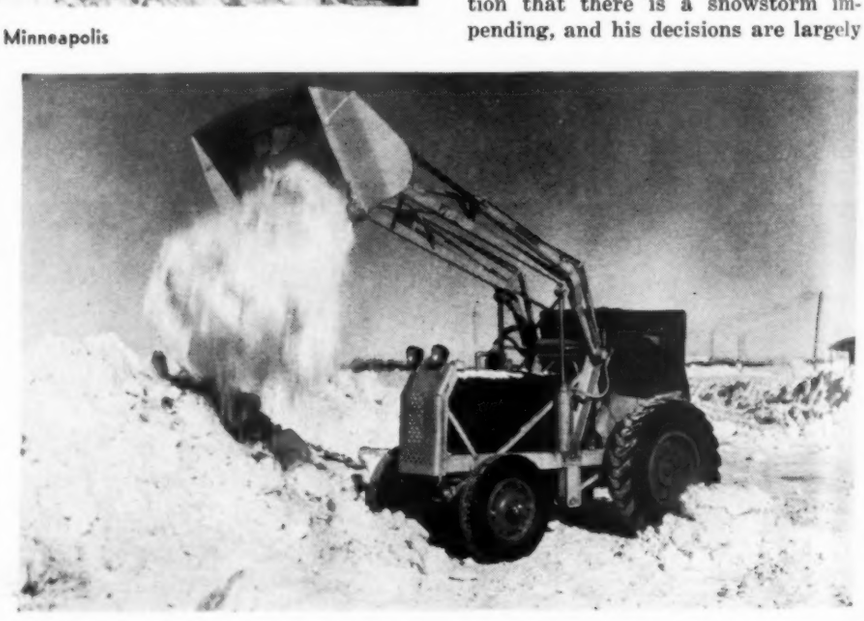
All snow is loaded and hauled away from the downtown business districts. The work is done at night. The city has 7 machine snow-loaders. To each snow loader there are assigned 10 to 15 trucks, two motor patrol graders, and 1 or 2 small tractors or a jeep. The patrol graders windrow the snow for the machine loaders. The small tractor or jeep is used to move the parked automobile which interferes with the snow-loading operation.

Outside of the congested areas, the snow loading and disposal is carried on in the daytime. On the longer runs, consisting of a mile or more, the mechanical snow loaders are used with the same supporting equipment as described for the operation in the downtown area. Adjacent to shopping centers, where the snow is removed for two or three blocks, 5 city-owned wheel type tractors, equipped with front-end loaders, are used. For this work, also, crawler type tractors with loaders are used, although these machines are not as mobile and fast for this kind of work.

Rotary on Bridges

The 1947-48 season saw some pioneer work done by the City of Minneapolis with a rotary snowplow attached to an all-wheel drive truck. This equipment was used particularly advantageously in connection with the removal of snow from some of the city's hundred bridges. Where the circumstances permitted, the snow was blown over the side of the bridge; where the snow could not be blown over the side, the chute on the rotary was reversed and the snow loaded and trucked. A large saving in time and money resulted from the adaptation of this equipment to this special type of work.

Snow plowing and removal in Minneapolis is conducted on a city-wide basis. The entire operation is in accordance with a pre-conceived plan, with an established priority and sequence by which streets are plowed and equipment distributed to each of the city's six districts. The Superintendent of streets is charged with the responsibility of determining when operations shall commence. He is in almost constant contact with the Weather Bureau with the first indication that there is a snowstorm impending, and his decisions are largely



★ Clearing an outlying intersection—a Lull loader representing a type of equipment found increasingly useful in municipal snow clearing

influenced by the advice of the weatherman.

The equipment division also is alerted when there appears to be a snowstorm on the way. The mechanical force is thrown into the snow organization and equipment in dead storage is immediately serviced and supplied with batteries, etc. When a decision is reached as to the actual start of plowing, the despatcher and his force, located in the central shop, immediately organize the crews. The city carries on its construction work on a day-labor or force-account basis, and so it has a large reservoir of labor to call upon for snow service. When the despatcher calls, the men are directed to their specific work locations. Truck drivers and equipment operators are given the number and location of the piece of equipment which they are to operate. The equipment despatchers have before them a large status board and can tell at a glance the current status and location of each piece of equipment.

Each snowplow operator reporting is given a cellophane-faced holder in which there is inserted a typewritten sheet of instructions listing the streets he is to plow, the order in which they are to be plowed, and any special orders or instructions which may apply to his particular assignment. The operator hangs these instructions in his cab and has them before him at all times.

Parked Car Problem!

In both the snowplowing and snow-loading operations, the parked car is a problem. When plowing, there is not a great deal to do but to simply work around the interfering car.

Moderate success, however, has been attained in the snow-loading work by the posting of signs in the areas in which the operations are to be carried on. These signs are made of paper, are nailed to a lath, and then stuck in the snowbank along the street on which the work is to be done, by 4 o'clock in the afternoon preceding the evening's work. The signs read, "No Parking 10 P.M. to 7 A.M. Snowplowing". This method is not 100% effective, and, as described before, tractors or jeeps are used to move the cars blocking the work.

Up to the present time, Minneapolis has not had too much difficulty with cars abandoned promiscuously during a snowstorm. Our people are accustomed to and respect snowstorms, and it appears that they do not venture to use their cars when forewarned of an impending snowstorm. Furthermore, cars used during the winter in this northern climate are perhaps better equipped to operate in heavy snows than in areas where snow is not such a frequent occurrence. Most cars have snow tires, chains, frost shields, and anti-freeze material in the radiators, lighter oil, etc. Being accustomed to snow, drivers are perhaps more skillful in handling their cars under heavy snow conditions and therefore succeed in getting them off the streets.

★ Athey loader busy on a Minneapolis arterial

2-Stage Synchronized Compressor System for Deep Piers

By Alexander Maitland

President, Kansas City Bridge Company, Kansas City, Mo.

Probably since their first substructure was constructed by the pneumatic caisson method, some contractors in this field have never abandoned the old type of slow speed, low pressure compressors for this service. Unfortunately, these low pressure units had no other utility than the originally intended use. Consequently, they sat idle in contractors' equipment warehouses most of their life, awaiting another pneumatic project. Some midwestern contractors have found these units were only in use on an average of 6 months in 4 years. When they were needed, or rather could be fitted into the project plant set up, the units were so heavy that present day freight rates prohibited their transportation to the site of the work.

Two midwestern contractors who have abandoned the old for the new are Kansas City Bridge Co. and Massman Construction Co. These contractors, presently constructing the Liberty Bend Cut-Off Bridge, near Independence, Mo., junked all their slow speed, low pressure air plants and set up a simple, compact and efficient plant that well served the needs of this project.

The plant consisted of 4 Worthington Blue Brute diesel driven units of 500 C.F. at 125 lb. each. The units were interlocked and synchronized so that the air demand determined the number of units in operation.

The discharge of high pressure air passed through a header system and then through an after-cooler which lowered the temperature and cleaned the air. This air was stored in a 370 C.F. receiver. Air from this receiver entered a tee header system containing two Fisher regulating valves, one in each leg and one master valve at the outlet of the header for additional protection in event of failure of either previous valve. Augmenting these automatic Fisher valves were four valves, manually operated for further protection in event of failure of automatic valves.

Other protective devices were installed, including carbon monoxide detectors and over and under pressure alarm system employing Mercoid switches and Crouse-Hinds electric alarms.

This plant furnished low and high pressure air required for the project, including air for high-pressure pneumatic tools operating in the caissons. It operated 103 continuous 24-hour days without maintenance other than usual lubrication and greasing.

Soil Cement "Side Show"

Airport area on Chicago Lake front processed during Road Show as a demonstration project by manufacturer group, and presented as a gift to the city. Labor and equipment use donated

★ Looking out over the North Island project

★ Compacting the subgrade—Iowa compactor drawn by Caterpillar DW10

ROAD Show visitors who took the special bus to Northerly Island, northeast of the exhibits, saw thirteen pieces of equipment in action on a full-sized soil-cement project. Twelve manufacturers donated all equipment and manpower needed to convert a 530' x 300' city dumping area into a parking area for planes. By the sixth day of the Show, soil-cement surfacing was completed and the entire area was presented to Chicago's Mayor Kennelly as a gift to the city.

Before soil-cement work could be started, all rocks, stumps and debris in the top 8 in. depth over the site had to be removed. The scarifier teeth and 13-ft. blade of an Austin-Western 99H power grader ripped out surface debris and shaped the subgrade.

Subgrade compaction was obtained with an Iowa Model 60 rubber-tired compactor, towed by a Caterpillar Diesel DW 10 wheel-type tractor. The compactor's vibrating action and super-imposed load enable it to compact the deepest fills.

Preliminary tests showed that best results in this dump material would be obtained by mixing in the top 6 in. about ½ bag of cement per sq. yd. Tests also showed that 13% water content and 115-120 lb. per cu. ft. density would produce the most satisfactory soil-cement surface.

Seven Steps

Soil-cement application, mixing and compaction were accomplished in seven steps as follows:

(1) Cement was spread on the sub-

★ Spreading cement—T. L. Smith cement spreader drawn and fed by Ford truck with Heil body

★ Rear view of cement spreading

grade by a T. L. Smith cement spreader supplied by a 5-ton Ford truck equipped with Heil hydraulic dump body.

(2) A P & H LA-106 single pass stabilizer pulverized, blended, added water and mixed and spread—all in one operation. Water was furnished by a 1,500-gal. Gunnison tank equipped Ford truck. This truck was also equipped with a pressure spray bar, used to add additional water as required by evaporation.

(3) The 6-in. layer of mixed surface material was compacted from the bottom up by a Heil TRO double-drum oscillating sheepsfoot roller, towed by an Oliver-Cletrac Model B track-type tractor. About 12 trips were required before the tamping roller "walked" on the grade.

(4) Compaction planes were removed by a spike-tooth harrow pulled by a Case SI industrial rubber-tired tractor.

(5) Final compaction was obtained by a Bros 45W pneumatic-tired, oscillating "wobblewheel" roller towed by the Case tractor. Each area was rolled three times.

(6) Final grade was shaped by the Austin-Western grader.

(7) And last, a dense, smooth surface was obtained by rolling with a Galion variable weight tandem roller.

Curing time was 7 days. During this period the water truck kept the surface wet. The city of Chicago plans to add a 1-in. asphalt surface.

This project was supervised by R. P. Jones of the Harnischfeger Corporation. Finishing operations on soil-cement work were directed by J. A. Leadabrand, construction engineer, soil-cement bureau, Portland Cement Association.

★ Processing soil and cement—the P & H single pass stabilizer seen at start of operation. Machine pushes its water supply truck (Ford with Gunnison tank)

★ Initial compaction—Heil sheepsfoot roller, Oliver tractor. Compaction planes removed by Case tractor-drawn harrow

★ Final compaction—Bros "wobble", with Case tractor

★ Final grade shaping was performed with an Austin-Western grader (shown here working subgrade)

★ Final rolling—Galion tandem roller

★ Keeping surface wet during curing period

★ Rock excavation in progress at west portal entrance of West Rock Tunnel Project, Wilbur Cross Parkway, near New Haven, Conn. L. G. Defelice & Son., Inc., of North Haven, Conn., is the contractor

Taking the Gamble Out of

Rock Excavation

Read your specifications! This practical article includes a suggested form for estimating

By E. T. Nettleton

Associate Highway Engineer,
State Highway Department of Connecticut,
Hartford

MOST contractors look upon rock excavation as a necessary evil which should be avoided whenever possible. Unfortunately, the rock excavation comes as part and parcel of the project as a whole and, therefore, should be seriously considered. Might it not be that contractors pay too little attention to rock excavation before they bid on the job, and render too much verbal expression about the rock after they are actually confronted with its removal? The old saying "A stitch in time saves nine" applies in this case. No doubt rock excavation has been one of the common causes for serious financial loss in highway construction.

Just why should this be? The average contractor has fewer valuable cost records of his past experience on rock excavation than any other item. Furthermore, the variance of conditions between different rock jobs limits the possibility of applying the unit rock excavation cost on one job to that of another job. In addition, the contractor rarely takes the time or trouble to make the proper field investigation of the rock on the project which is to be bid. These facts explain why rock excavation is such a gamble. In algebra X is the unknown. It is high time that more contractors take the X out of rock eXcavation.

Read Your Specs!

Naturally the first thing to do after it is known that rock excavation will be encountered is to read the specifications:

Is payment for rock excavation to be included under a "Rock Excavation Item" or as an "Unclassified Excavation Item"?

How is rock defined?

Does rock, boulder or ledge have to be over ½ c.y. or 1 c.y. before payment as rock is allowed?

Is concrete, reinforced concrete and masonry paid for as a "Rock Excavation Item," or is payment allowed elsewhere?

Does the overburden have to be stripped off clean from the rock or may the rock be exposed by test holes in order to make measurements for pay?

What are the limitations on blasting?

What are the regulations as to the storage of dynamite and caps?

What are the limitations on disposal of rock as to location, maximum size of rock, and placing?

May the blasted rock be used for other purposes than fill, such as for

sub-base or rip rap?

If rock may be used for other purposes than fill, just how is adjustment made in the prices of unit items affected?

If rock can be placed in large fills, it will result in considerable economy, since the ledge need not be broken into such small pieces. This economy is obtained by the wider spacing of drill holes and the saving in the amount of explosives required.

If the specifications do not require removal of all overburden in order to measure the rock, it is another definite advantage to the contractor. The overburden may then serve as a protective mat in blasting and high stripping costs are eliminated. Furthermore, the contractor can load and haul the excavated material consisting of a mixture of rock and earth with more economy. The earth partially fills the rock voids in his shovel bucket and hauling conveyances. In addition, the mixture is more easily placed in the fill and a more stable embankment is obtained.

Investigate the Site!

The second thing to do is to thoroughly investigate the site and examine all of the ledges:

What type of rock is it?

Is the rock naturally abrasive and consequently wearing on bits?

Has the ledge any natural seams? If so, which way do the seams run?

Are existing structures located either nearby or else at some distance and built upon the construction of the ledge to be blasted?

Is any of the rock weathered or disintegrated to such an extent that either power shovels or rooters may remove the rock?

What Equipment Needed?

If the rock is of an abrasive characteristic heavy costs may occur in the replacement and sharpening of bits. The type of explosives to be used will vary with the kind of rock and its characteristics in the ledge. Should the rock be of a disintegrated nature or the ledge full of seams, it is quite possible that blasting and drilling might not be necessary. Where drilling is necessary, the depth of the holes, amount of drilling to be done and the ledge formation will dictate the most economical method, be it well drills, wagon drills, tripods, jackhammers or combinations of these various methods.

From the study of the specifications, examination of the site, consideration of the quantity of rock to be excavated and the amount of time allowed for this work, the contractor is now in a position to determine the necessary equipment that should be required. Naturally, in heavy rock large shovels should be employed. When this is done, large fragments of rock can be loaded and there is less danger of rock becoming wedged in the shovel bucket; the shovel has more stamina and strength to rip out disintegrated rock and rock not thoroughly broken up by the blasting. The hauling conveyances should be large enough that they can carry any rock which the shovel can load and should be so designed that they may dump this load without clogging. Trucks with swinging tail boards should never be used in rock excavation.

The contractor's estimator armed with the above information is now in a position to take over and scientifically calculate the anticipated rock excavation expense. These charges for the sake of clearness should be subdivided into stripping, drilling, blasting, loading, hauling and filling costs.

The foregoing article and the following estimate form appeared in "Nerba."

ESTIMATING THE COST OF ROCK EXCAVATION

In making up any form for estimating rock excavation it is impossible to make one form to cover all types of rock excavation. Special rock work as required in tunnels, subways, quarrying, sub-aqueous footings and foundations is not included herein. Hydraulic methods of stripping of rock also are not considered. The form used here would apply only for ordinary rock excavation as found on a typical highway construction project.

In applying this form to specific job bidding units the estimator will have to consider the particular specifications he is working under and make the necessary adjustments. For example many specifications are so worded that the stripping costs are paid for as "earth excavation." Other specifications allow for hauling costs on a "station-yard" basis with "overhaul" allowed for extra distance. Some specifications call for "unclassified excavation" only in which case rock excavation and earth excavation are paid for at the same price. Regardless of these various differences the excavation of rock is a costly and distinct item and should be estimated separately. It may be necessary due to the specifications to combine the individual earth unit cost and individual rock unit cost into a weighted average for bidding purposes.

Special caution should be used to apply the higher insurance rates applying to rock excavation work.

I—Stripping Costs

(Loading only—hauling and disposal incl. later)

Necessary Information

Average depth of stripping ..... Area to be stripped .....

Estimated ..... c.y. to be stripped. Location of disposal of stripped material .....

Method and equipment to be used in stripping .... Estimated ..... c.y. to be stripped per average day.

Total working days to do this work .....

Estimated Costs

(a) Equipment cost

Moving expense to and from job, lump sum $.....

Loss time expense moving on job between cuts, lump sum $.....

Daily rental value of equipment (incl. minor repairs).

Shovels @ .....
Bull dozers @ .....
Scrapers @ .....
Trucks @ .....

Sub-total $ .....

x No. of days ——
Sub-total $.....
% Profit and overhead on equipment——
Total equipment $.....

(b) Material & Supplies

Gasoline, oil & grease for equipment $.....
% Profit and overhead .....

Total materials and supplies $.....

(c) Labor

Foreman ..... @ ..... = ...
Equipment operators..... @ ..... = ...

Greasers ..... @ ..... = ...
Truck Driver ..... @ ..... = ...
Laborers ..... @ ..... = ...

Sub-Total $..... x No. of days = ...
% Ins. Social Security, taxes, etc. = ...
% Profit and overhead ..... = ...

Total Labor..... $.....

II—Drilling Costs

Necessary Information

Type of rock ..... Seams and faults .....
Hard or soft rock ..... Abrasive characteristics .....
Dry or wet drilling ..... Ordinances require dust collectors? .....
What types of drills will be used: Well ..... Wagon ..... Tripod ..... or Jackhammers .....
Various lengths of drill steel required .....
Detachable bits required ..... Where sharpened .....
Is it necessary to set up a blacksmith shop? .....
Maximum depth of holes ..... Avg. depth of holes ..... Size of holes .....
Spacing of holes ..... Estimated l.f. of drilling ..... primary, ... secondary.
Estimated average speed obtained in drilling in l.f./hr. ..... primary, ... secondary, c.f. of air required per minute for drilling .....

Estimated Costs

(a) Equipment cost

Moving expense to and from job. Lump sum .....
Loss time expense moving on job between cuts. Lump sum .....
Daily rental value of equipment (incl. minor repairs)

Blacksmith shop ..... @ ..... = ...
Drill sharpeners ..... @ ..... = ...
Drill steel and bits..... @ ..... = ...
Coiled heaters ..... @ ..... = ...
Compressors ..... @ ..... = ...
Pick up truck..... @ ..... = ...
Drills ..... @ ..... = ...

Sub-total $..... No. of days _____
Sub-total $.....
% Profit & overhead on equipment _____
Total equipment $.....

(b) Materials & Supplies

Gasoline, oil, grease & water $..... per day ..... No. of days = ...
Coal for blacksmith shop ..... tons @ ..... = ...
Service costs—Sharpening of bits off job .....bits @ ..... = ...
Service Costs—Straightening of dull steel off job. Lump sum = ...
Purchase of hose, couplings and valves. Lump sum ..... = ...
Sub-total $.....
% Profit & overhead on equipment .....
Total materials and supplies $ .....

(c) Labor

Foreman ..... @ ..... = ...
Compressor operators.... @ ..... = ...
Drillers ..... @ ..... = ...
Drillers' helpers ..... @ ..... = ...
Blacksmiths ..... @ ..... = ...
Blacksmiths' helpers..... @ ..... = ...
Laborers ..... @ ..... = ...

Sub-total $..... No. of days = ...
% Insurance, social security, taxes, etc. = ...
% Profit and overhead = ...
Total labor = $.....

III—Blasting Costs

Necessary Information

Type of rock ..... Seams and faults ..... Inclination of .....
Hard or soft rock ..... Adjacent structures limiting charges .....
Restrictions on blasting amount ..... time ..... flagmen .....
Location of dynamite storage ..... Location of exploder storage .....
Max. size stone wants to be broken to ..... Kinds of explosives to be used .....
Where are explosives obtained ..... How transported .....
Estimated lb. of explosives required for blasting per c.y. of solid rock ..... lb. springing holes ..... lb. primary ..... lb. secondary.
For the total job ..... lb. Springing holes ..... lb. Primary ..... lb. secondary.

Estimated Costs

(a) Equipment cost

Moving to job and setting up dynamite sheds—Lump sum.
Daily rental value.

Sheds ..... @ ..... = ...
Blasting batteries ..... @ ..... = ...
Pick up truck..... @ ..... = ...
Sub Total .....
Sub Total .....
% Profit & overhead on equipment .....
Total equipment $.....

(b) Materials & Supplies

Dynamite ..... lb. @ ..... = ...
Caps or exploders ..... Ea. @ ..... = ...
Fuse ..... l.f. @ ..... = ...
Wire ..... l.f. @ ..... = ...
Tamping bags ..... Ea. @ ..... = ...
Blasting mats ..... Ea. @ ..... = ...
Gasoline for pick-up truck ..... Gals. @ ..... = ...
Blasting permit .....Gal. Ea. @ ..... = ...
Sub-total _____
% Profit on overhead on materials and supplies .....
Total materials and supplies $_____

(c) Labor cost

Foremen ..... @ ..... = ...
Blasters ..... @ ..... = ...
Blasters Helpers ..... @ ..... = ...
Watchmen ..... @ ..... = ...
Flagmen ..... @ ..... = ...
Laborers ..... @ ..... = ...
(cleaning debris) ..... @ ..... = ...

Sub-total $..... x No. of days = _____
Sub-total $.....
% Insurance, social securities, taxes, etc. = ...
% Profit and overhead = ...
Total Labor $.....

IV—Loading, Hauling, Fill Costs

Necessary Information

Maximum size of rock to be handled ..... Size of shovel bucket ..... Type of hauling conveyances ..... Capacity of hauling conveyance .....

Avg. length of haul ..... Estimated shovel load ..... c.y. per hr. Number of hauling units necessary ..... Bulking % solid rock to loose rock .....

Loading time ..... Hauling time ..... Dumping time ..... Returning time .....

Loss time ..... Total time ..... Est. trips/hr. .....

Method of spreading fill ..... Equipment necessary .....

Specification requirements, placing rock .....

Estimated Costs

(a) Equipment

Moving equipment to and from job .....
Sheds for equipment .....
Gas tanks, oil sheds, etc. .....
Daily rental value of equipment (incl. minor repairs) .....
Grease truck ..... @ .....
Shovels (loading rock) ..... @ .....
Hauling conveyances ..... @ .....
Bulldozer (on fill) ..... @ .....
Roller (on fill) ..... @ .....
Grader
(keeping hauling road in shape @ .....

Sub-total ..... x No. of days = ...

Sub total $.....
% Profit and overhead on equipment .....

Total equipment $.....

(b) Materials and supplies

Gasoline .....Gal @ ..... = ...
Oil .....Gal @ ..... = ...
Grease .....Lb. @ ..... = ...

% Profit and overhead on materials and supplies .....

Total materials and supplies $.....

(c) Labor

Foremen ..... @ ..... = ...
Hauling conveyance drivers..... @ ..... = ...
Flagmen ..... @ ..... = ...
Equipment operators ..... @ ..... = ...
Mechanic ..... @ ..... = ...
Grease truck operator ..... @ ..... = ...
Laborers ..... @ ..... = ...

Sub-total $..... x No. of days = ...
% Insurance, social security, taxes, etc. = ...
% Profit and overhead = ...

Total labor $.....

V—Total Rock Excavation Costs

	Equipment	Materials and Supplies	Labor	Total
Stripping Costs	.....	.....	.....	.....
Drilling Costs	.....	.....	.....	.....
Blasting Costs	.....	.....	.....	.....
Loading, hauling and filling costs	.....	.....	.....	.....
	$.....	$.....	$.....	$.....

Total Cost $..... = $..... estimated unit cost per c.y. of solid rock including profit and overhead.

c.y. rock excavation payment allowed.

Tejan Joins Contractor Group; Labor Progress Reported

The appointment of Thurman C. Tejan to the personnel of the Constructors Association of Western Pennsylvania was announced today by D. Dinardo, Association president. Mr. Tejan, a graduate of Pennsylvania State College and the University of Kentucky Law School, will devote his efforts primarily to labor management relations of the Association as well as the relations with the awarding authorities in connection with the rules and regulations (specifications) under which the members of the Association bid and carry on the work of constructing various types of public works.

Thurman C. Tejan

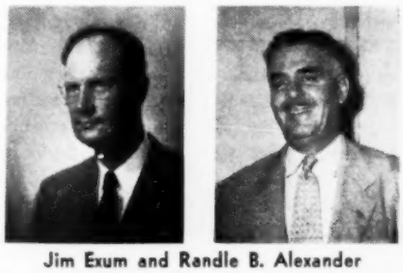
Recently the first Union Shop Election in the construction industry under the Taft-Hartley law was held by the National Labor Relations Board in the Western Pennsylvania area of 33 counties which the Association is chartered to cover. The result was the establishment of Union Shop conditions throughout the area.

Alexander Succeeds Exum in Texas Bridge Post

James P. Exum, bridge engineer of the Texas highway department for many years, has resigned and is succeeded by Randle B. Alexander, according to state highway engineer DeWitt C. Greer.

Exum has joined Howard, Needles, Tammen and Bergendoff, Consulting Engineers, in New York. A graduate engineer of the University of Texas, he made a notable record in the design of important bridges in his native state. He is credited with adding architectural beauty to structural utility, making Texas bridges among the most attractive in the nation.

As a member of the American Association of State Highway Officials Bridge Design Committee, Exum aided in revising and modernizing standard bridge specifications throughout the nation.



Jim Exum and Randle B. Alexander

Alexander's appointment to the top bridge post comes after twenty-five years with the Texas highway department. His latest assignment was that of supervising construction engineer for the new Express Highway being constructed between Houston and Galveston.

Closing the Gap Between Research and Practice

By C. A. Hogentogler, C.E.

Mathematical Theory, Research Data and Common Sense

Continuing a series of articles, the purpose of which is to discuss the field of highway research, a field which a number of authorities claim is not linked closely enough to the practicing highway engineer. The author uses a new and necessarily bold line of approach to clarify some of the basic concepts and some of the confusion that seems to exist in the whole field.

Comment and discussion are invited, addressed either to The Editor, Roads and Streets, or directly to the author, at 1927—37th Street, N.W., Washington, D. C.—**The Editor**

ON January 1, 1945, the Public Roads Administration relieved the writer of his duties as head of the Sub-grade Soil Section, and placed him in charge of a newly inaugurated project. The principal objective of his new work was to increase the use of present-day soils knowledge in practice. The approach to this purpose included a lecture course on the subject. The course was specially prepared for design, construction and maintenance engineers and, with several exceptions was given exclusively to them.

In all, some 150 engineers attended the course and, during the five days required for its presentation, they were excused from all other official duties. In a further effort to ensure their undivided attention, the lectures were given in a building separate and apart from the ones which housed their offices. Also ample time was provided for frank discussion among those attending, but differing from the lectures which dealt only with stabilization and soil mechanics, the discussions were permitted to consider all problems of interest to the road builder. Therefore, instead of being merely soil courses, the sessions filled more properly today's urgent need of the profession—namely, the strictly informal, off-the-record conferences where vital questions, not suitable for treatment in academically programmed meetings, could be freely and openly considered.

Closer Cooperation Needed

While these conferences left the writer with a number of valuable impressions, two impressions stand out prominently from the rest. They can be summarized as follows:

1. Whereas the original purpose of highway research was to answer questions which troubled the engineer, the research field has grown with such leaps and bounds that it now functions as an activity of its own, more or less independently of the construction field. **While much of the prime purpose of this research is still retained, many of the contributions included in the volumes being published under the caption "Highway Research" show more the result of research carried on for the sake of research alone, than for the immediate benefit of the highway engineer.**

2. As the research field assumed more and more this status of primary importance, a noticeable gap seemed to develop between it and the field of construction. Because of this gap, these two components of highway engineering appear to function with decreasing connection with each other.

Certainly no one can criticise the research field for the remarkable strides that it has made in its work. The mere fact that all the results now forthcoming are not immediately helpful to the practicing engineer should give no one undue concern. Neither should the possibility that some of the results will never prove of help. For, as the late Clifford Older once stated:

"In research it is better to spend $5,000 for information which proves to be worthless than to save $100 at the risk of missing one essential item."

On the other hand, no blame can be attached to the practicing engineer for the obvious lag which gradually developed between the production of research data and its use in construction. From the standpoint of time alone, busy engineers could not possibly read more than a minute percentage of the great mass of material which is now published under the label "Highway Research," let alone being able to analyze and interpret it in the light of their own particular needs as well.

At the same time, the development of such a gap is generally recognized and, unless something is done to close, or at least narrow it considerably by bringing the two fields into closer cooperation with each other, the time may come when it will no longer be considered that highway research is a very profitable venture insofar as highway construction is concerned.

Evaluation Yard-sticks Badly Needed

As one means to narrow the undesirable gap just mentioned, much thought has been given to a middle-ground activity—an activity which aims to interpret research findings from the practical view-point, and to present the resulting applications to the profession. This badly needed and very valuable work which has passed the research phase to enter the field of planning, now constitutes the technical committee function sponsored by the American Road Builders' Association under the able direction of H. F. Clemmer and A. Diefendorf.

In addition to this laudable under-

taking, however, the conference referred to above, convinced the writer of the urgent need of another type of information—information which today is conspicuous by its absence from current engineering literature. This information is comprised of yard-sticks and similar guides which will adequately enable the busy engineer first to properly select from the great mass of research contributions now available, those which he will find it profitable to read; and secondly, to properly evaluate in the light of his pressing problems, the findings in those reports which he has selected to read.

Much of the current information can be made usable to him if interpreted by other competent authorities. Certain types, however, can become more profitable to him if interpreted in the light of his own experience.

It is to the discussion of such possible evaluation guides as well as the clarification of certain problems which, at least on the surface, now seem to have reached a state of confusion, that this and subsequent articles by the writer will be devoted. Most of the material to be presented is of a debatable type and it is hoped, among other things, that the articles will encourage comments from the readers. For nothing is more helpful, in a complex situation, than frank and open discussion by all parties concerned. Such comments can be addressed to either the Editor of ROADS AND STREETS, or the writer.

Road Building Knowledge in Three Parts

For convenience of discussion, present day knowledge on the art of highway construction can be considered as the combined result which originates from three separate and distinct sources. First in order comes that part furnished by mathematical theory, secondly is the practical application of research data, and finally comes the part gleaned through the exercise of common sense. All three of these parts are essential to complete the picture, although each part has its own particular function to perform. If these functions and the true significance of each part, in its relation to the other two parts, are thoroughly understood and strictly adhered to, the reader of a new contribution to the subject should have no difficulty whatever in accurately evaluating the material for use in the solution of his own specific problems. Therefore, as a first step in an attempt to establish better understanding between the research and construction fields of endeavor, each of these sources of knowledge is discussed in detail.

Mathematical Theory. In the last analysis, a theory is nothing more nor less than one man's opinion. If an individual has the mathematical equipment needed to express his opinion by means of a formula, his opinion becomes a mathematical theory. The fact that one individual can express his opinion by means of a formula, whereas another cannot, does not mean that the first man's opinion is more accurate than the second man's, but only that the first man is a better mathematician than the second. On the other hand, the second man might be by far the better engineer and have correspondingly more accurate opinions, even though he lacks the mathematical training of the first man. It should be emphasized that, while belonging to a highly honored profession, an adept mathematician is still not an engineer; and also that it is not necessary to be well versed in the intricacies of higher mathematics in order to qualify as an experienced and expert highway engineer.

But there is an advantage in having a good engineering opinion expressed by means of a formula. It was the writer's good fortune to hear this advantage explained to a group of scientists from the U. S. Geological Survey, by Dr. Karl Terzaghi some 20 years ago. According to that eminent authority an opinion embodied in a formula can be checked with the performance of structures under service conditions and if found incorrect, can be modified by means of correction coefficients to serve as a useful and accurate tool of design. The same cannot be done with an opinion not mathematically expressed.

However, many opinions cannot be expressed mathematically without the use of assumptions. These assumptions may be true to fact, only partly true, and in some cases, contrary to fact, and, depending upon the complexity of the formula, the assumptions may vary in number from several to a dozen or so. Obviously, the accuracy of results furnished by the use of a formula depends largely upon the validity of the assumptions on which the formula is based. Also, the variety of values which may be furnished by use of the same formula in answer to the same specific question, depends largely upon the number of numerical values which must be assumed for use in the computations. Therefore, in order to correctly evaluate a theoretical expression for use in solving a specific problem of his own, the engineer must familiarize himself just as thoroughly with the assumptions on which the formula is based and the source of the numerical values which must be used in the computations, as with the formula itself.

Research Data. Under the term "research data" may be included the results furnished by all types of experiment and investigation, ranging from tests on the smallest laboratory samples to full-scale traffic tests on highways and airports. Here the engineer has no longer to deal with assumptions, opinions or theory, but instead with plain unadulterated facts. A famous scientist once remarked that no experiment ever gave faulty results. Many times, however, the analysis and interpretation of the data are at fault. Therefore, if conclusions drawn from research data seem to be at variance with common knowledge, the proper course is not to throw out the data as worthless, but instead to make a careful study of the method of analysis used in obtaining the questionable conclusions. In all cases, it is just as important to thoroughly understand the arbitrary or artificial conditions employed in the performance of tests and investigations as it is to know the conclusions themselves. Then, depending upon the extent to which the engineer considers that the conditions of test simulate or conform to those to which the structure will be subjected in actual service, he can determine for himself, the relative value of the conclusions in the solution of his problem at hand.

Common Sense. For information on this much-used and often-abused term, the writer draws on a little book entitled "A New Conception of Matter." It deals with atoms, electrons, protons, etc., and was written by Chas. G. Darwin, Tait Professor of Natural Philosophy, University of Edinburgh, one of the world's foremost atomic experts. According to Professor Darwin, "common sense" may be defined as the generalization of our previous experience; and it constitutes the distinguishing working tool of the engineer. For many years Commissioner MacDonald had hanging on the walls of his office in Washington a motto which read: *"Engineering is Applied Common Sense."*

In a new activity, where there is no previous experience, the engineer has no "common sense" to guide him and then he must resort to opinions. This is aptly stated by Professor Darwin as follows:

"The discoverer of a really new principle has nothing of the kind (common sense) to guide him. Therefore, every new body of discovery is mathematical in form, because there is no other guidance that we can have. But as familiarity grows, we find unsuspected analogies with our previous experience, and the *engineer* gets his chance of replacing the *mathematician.*"

The construction of highways is not

a new activity and, therefore, the engineer has an ample fund of previous experience to guide him. But the question arises: Where do we find a record of this previous experience? Publications by highway and airport research organizations contain a wealth of material on mathematical theory and research data, but to complete the picture there is needed also a record of what the engineer has learned through his experience in the design, construction and maintenance of highways over periods of 10, 15 or 20 years.

The writer is especially enthusiastic over the off-the-record informal conference because that provides one of the means of finding out what the engineer's experience has taught him. However, there is another place where this information can be found.

Quite recently, the American Road Builders' Association published a "Report of the Committee on Concrete Pavement Design." The report contains a very complete record of the current practice of each state highway department. From that angle alone it is interesting information. But the contents of that publication have a far deeper significance than just an interesting reference. Typical of the busy, practicing engineer, he is not prone to set down his knowledge in report form but, instead, prefers to embody it in his work. Therefore, the present day practice of any state highway department can be considered as typifying its knowledge of the particular activity as learned through its experience, flavored with additional information which it has been able to utilize from the field of Highway Research. Therefore, it is to be hoped that more of these valuable reports on "current practice" will be forthcoming.

It should be noted, however, that the practice in all of the states is not one and the same; and this is to be expected. The traffic conditions, environmental factors and other influences on pavement performance in one state may differ from those in another. Consequently, the experience with exactly the same pavement type can be expected to vary in the two states. This, in turn, causes what has been termed the "principles of common sense," and, consequently, the dependent road practice, to be different in the two states.

To summarize, then, resort must be made to mathematical theory when neither research data nor experience are available. As experiment and investigation provide factual data, the theory may either be substantiated and become a valuable working tool, or be discarded. Finally, as the structures themselves come into being and are subjected to service conditions, a knowledge of their performance or "the principles of common sense" is likely to take precedence over all.

In the field of foundation engineering this pertinent fact has been recognized for some 10 years now. To illustrate, I refer to Dr. Terzaghi, Transactions A.S.C.E., 1938. He states:

"Considering the present state of knowledge in the field of foundations, the settlement observations represent by far the most important type of research. The results of theoretical and laboratory investigations in this field cannot claim more than an academic value until the importance of errors has been investigated thoroughly and repeatedly."

Jacob Feld, in the same Transactions, summarizes the situation as follows:

"From time to time, reports of and papers sponsored by the Committee of the Society on Earths and Foundations have appeared in the Proceedings. Except for this Symposium, the reports were optimistically heralding the advent of a new era in foundation engineering and the birth of a new soil science. The humility of approach in the 1937 reports, as so well exemplified in the paper by Professor Terzaghi, is refreshing and it is well that the change of attitude has taken place. Too many practical and practicing engineers were attempting to apply the published material to their work; and they were finding it of little help.

"If the paper by Professor Terzaghi is to be taken as a criterion, the subject is in a new phase. Theoretical and laboratory investigations are relegated to second position; *field investigations of completed structures* must now be stressed so as to collect the necessary facts . . ."

Future Research Depends Upon Practical Decisions

Despite the strides made in the field of research, and the wealth of knowledge gleaned through many years of road building, much yet remains to be learned about the art of highway construction. While it is possible to list a hundred or more problems which are well deserving of study, the unusually heavy traffic of World War II introduced just about three problems which demand immediate solution if the best returns from current highway expenditures are to be realized.

Also current highway appropriations provide funds which, with the approval of the Federal Works Administrator, may be utilized by each state highway department for research. Therefore, it lies entirely within the province of the practicing highway engineer to decide upon the best approaches to be used for the quickest solution of these especially pressing problems.

Among the pertinent questions regarding this new research which he must decide upon, the following may be listed:

1. On what part of the work can the private consultant prove helpful?
2. Which phases of the experimental work can best be handled by the University Experiment Stations?
3. How much of the total effort should be devoted to the investigation of full-scale pavement sections placed at locations where rigid laboratory control is available?
4. How much of the total effort should be devoted to the making of detailed surveys of typical roads in service?
5. Would it prove profitable to move the research laboratories into the field in order to make extensive studies of specially selected roads where more or less spectacular and unexpected failures have occurred?
6. Should a number of new "Bates Experimental Roads" be constructed in representative areas, and be tested by accelerated traffic to failure?

Depending upon the engineer's attitude toward the subject in general, and his specific answer to such questions, it is possible that an entirely new and highly profitable field of highway research will be opened up.

Finally, to prevent any misunderstandings, it should be emphasized that the *California Bearing Ratio* (C.B.R.) method of design never has been, and is not now, a mathematical theory. After the bearing ratio test had been devised, Mr. O. J. Porter first, and then the U. S. Army and the various state highway departments, etc., correlated results with the performance of roads in service and, in this manner, determined the required thicknesses of flexible pavements on the basis of experience or *the principles of common sense.*

Imports of Construction Machinery

Australia

	1943-44	1944-45	1945-46
U. S.—	£335,000	£208,000	£272,000
United Kingdom—	£141,000	£193,000	£243,000

£=$3.22 U. S. Currency.

India

Government of India has placed an order with Tata Iron & Steel Co., Calcutta, to manufacture 950 road rollers. These are the first they have ever made.

The first four of these road rollers already have been delivered. These were named after cities in India.

Effect of Jet Heat on Airport Pavements

By Walter R. Macatee

Manager, Airport Division, American Road Builders' Association, Washington, D. C.

AIRPORT pavement discussions are often filled with more than their share of fallacies. Consider the furor which centers around alleged destructive effects of aircraft jet-power plants' heat on airport pavements. Jet-heat applied to pavements was reputed to be in the order of 1500 to 2600 deg. F. It was said to cause even strong concrete pavement slabs to crumble, and to destroy the plastic materials which form expansion joints, installed to compensate for volume changes which take place in concrete due to increased seasonal temperatures of a normal nature.

Even a cursory study of the configuration of cones of heat which come from tail pipe nozzles of turbo jet airplanes shows the absurdity of statements by prophets of gloom that heat from jet-propelled aircraft would cause pavements to spall and disintegrate. The vertical distance of turbo jet tail pipes, from which the heat of jet type aircraft is emitted, are located sufficiently far above the surface of pavements to cause the heat to be largely dissipated long before it is radiated onto the ground.

By using accurately placed thermocouples to measure the heat at various radial distances from tail pipe nozzles on jet-propelled aircraft, the temperature of jet-heat has been found to be relatively low as the diameter of cones of heat increases only slightly. True, the heat immediately in rear of the center of tail pipe nozzles is very intense. Nevertheless, it declines quickly from 400 deg. C. at that point, cooling to 50 deg. C. at a point only two feet above or below the outlet of tail pipes. Horizontally, the heat likewise declines rapidly, being less than 80 deg. C. at a point 50 ft. in rear of the very center of tail pipe nozzles.

Horizontal Direction from jet's outlet is not the critical consideration in the matter of measuring jet-heat which travels parallel to runway surfaces; it is the radial distance from the nozzle in the tail pipe which really counts. As shown, the heat declines to 50 deg. C. at a point only two feet above or below the center of the cone of heat, and this is relatively far above the surface of airfield pavements.

Heat from the Sun's Rays often rises to 140 degrees F. on pavement surfaces. Therefore, even laymen who study the extent and pattern of a jet's discharge of heat recognize that the intensity of jet-heat which actually reaches runway surfaces would be of an order far below those temperatures which could cause destruction or harmful spalling of concrete or other pavements which support heavy aircraft. Maintenance operators who spend tedious and long periods in melting down asphalt pavements in cities, using intense and concentrated heat applied directly to street surfaces for relatively long periods to effect repairs from time-to-time, indulgently laugh off stories that the path of the jet's heat-cone, passing well above runway surfaces, and doing so relatively quickly, could cause airfield pavements to melt and run off.

Fuel Spillage Problem

When stories pertaining to the damaging effect of heat which creates jet-power were debunked, yarns arose that aircraft fuel would be emitted in damaging quantities from turbo jet aircraft onto airport pavements. As the legend went, such fuels would act as a solvent, rendering impotent asphalt binders used in flexible pavements on taxiways and runways at many of the country's airdromes. Also that they would destroy expansion joints used in rigid pavements.

Fantastic stories arose that fuel remained unburnt in jet-propelled aircraft, and was then wastefully discharged onto airport surfaces from tail pipes of jet planes. Such spillage was said to act as a solvent, destroying the binding qualities of bituminous materials, and this was said to cause pavements to disintegrate, especially at take-off points on runways, reflecting far from complimentary implications concerning the ingenuity of the country's aircraft designers. Such designers feel justifiable pride in having developed efficiency and economy in effecting complete combustion of fuels used in powering jet planes.

Aircraft Engine Designers Scoff at stories of only partial combustion of fuels used in jet planes. But they realize that unavoidable fuel spillage occurs at points remote from runways and most taxiways. These areas are on aprons where aircraft engine-maintenance operations are carried on. The Army's Corps of Engineers, and Air Force specialists give these areas special consideration, and often install concrete where unusual spillage may be expected where engines are over-hauled. This is done even where an airport's principal pavements might be asphalt.

Heavy Tars Used

These Special Areas are sometimes paved with flexible types, but are given surfaces using a heavy-bodied tar. Such products are resistant to the stripping action of solvents, such as fuels used in jet-propelled aircraft. Because of the volatile nature of such fuels, some designers of airport pavements assert jet fuels disappear relatively quickly through volatilization. However, this would probably not be valid in areas where maintenance of aircraft is a continuous operation.

To Avoid Overfilling fuel tanks on aircraft, designers install tell-tale signals which warn when tanks become nearly filled. This removes possibility of wasting fuel at loading stations. As a further safeguard, auxiliary tanks are installed adjacent to aircraft's main tanks. These capture any fuel that might overflow, causing waste, and possible damage to pavements and to property resulting from aircraft skidding on surfaces which might be lubricated with spilt fuels.

High Velocity Blasts of air discharged from jet engines—800 ft. per sec. at the tail pipe nozzle—do present a problem with respect to maintaining unpaved shoulders of runways and take-off areas. The force of jet blasts dislodge unbound particles which compose shoulders close to runways, and frequently destroys turf unless it has become deep-rooted. Paving engineers recognize the need for developing low cost cementing binders to prevent damage to close-by shoulders which results from unbelievable force of air pressure generated by blasts from jet-propelled aircraft. Such engineers are not, however, too greatly impressed by unfounded reports about jet-heat and spillage of aircraft fuels destroying airport pavements.

●

Soils Engineering Fellowships — Several graduate fellowships in the soils engineering field are available at Cornell University, Ithaca, N.Y., for the 1948-49 academic year.

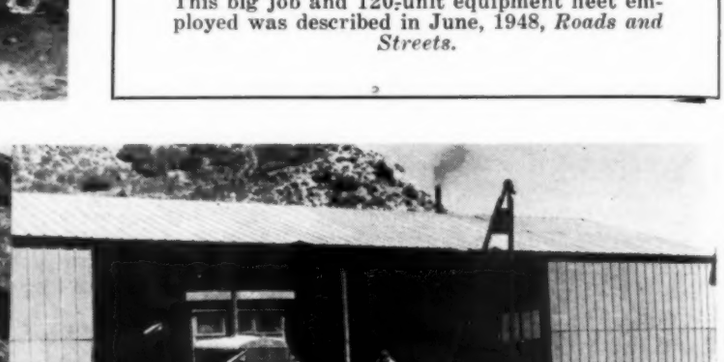
★ Winston Bros. Company centered its field repairs in a 100 x 145 ft. demountable shop building

★ Current for shop lighting and welding was supplied by a Palmer light plant powered by two International gasoline-motors

Shop and Service Facilities on Winston Brothers California US 99 Project

This big job and 120-unit equipment fleet employed was described in June, 1948, *Roads and Streets.*

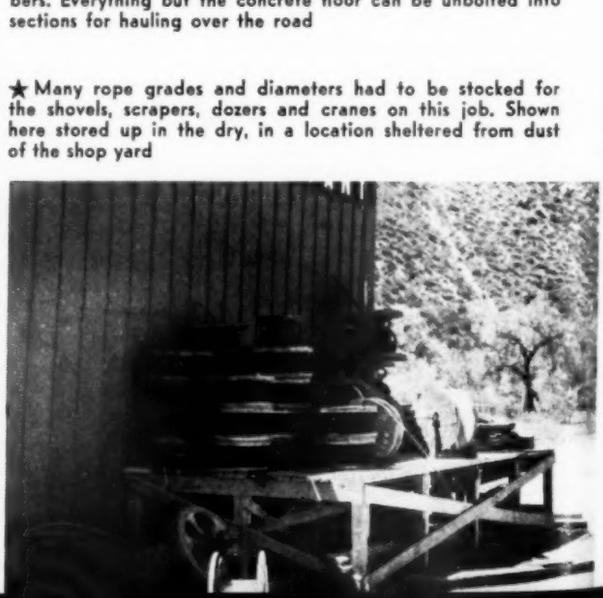
★ Converted 4-wheel-drive Army rig came in handy as a trouble shooting car. Carried a light plant and flood for night-time repairs. Here the service man is adjusting a motor while the operator is shooting craps during lunch hour



★ Two bays are enough in sunny California. Much repair work can be done outdoors

★ Inside of the main shop building. Note stout A-frame and hoist for engine repairs, and bolted connections in roof members. Everything but the concrete floor can be unbolted into sections for hauling over the road

★ Many rope grades and diameters had to be stocked for the shovels, scrapers, dozers and cranes on this job. Shown here stored up in the dry, in a location sheltered from dust of the shop yard



Preheating for Welding is Heat Treatment

THE importance of preheating in the welding operation is well recognized as a crack preventive measure. It is included in modern specifications for the joining of metals under all conditions where there is even the slightest possibility of weld defects. However, it is less generally recognized that preheating also accomplishes other useful effects. These are well described in the following excerpts from "Welding Metallurgy" by Henry and Claussen.

"Preheating may be used for a number of reasons among which are the prevention of hard cracks, hard zones and shrinkage stresses and the reduction of distortion. Heat treatment, on the other hand, cannot prevent cracks that occurred during welding. . . . Whatever other effect preheating may exert, it is a universal rule that it lowers the cooling rate after welding. For a given condition of welding (current, welding speed, etc.) cooling rates will be faster for a weld made without preheat than with preheat. The higher the preheating temperature, the slower will be the cooling rates after the flame has passed. Besides reducing the temperature gradient, which is the principal factor governing cooling rate, preheating lowers the thermal conductivity of iron. The thermal conductivity of iron at 600°C (1112°F) is only half the thermal conductivity at room temperature. Low thermal conductivity necessitates slow withdrawal of heat from the welded zone, and correspondingly slow cooling rates. . . ."

"Reduction in cooling rate by preheating increases the time spent by the heat-affected zone in the temperature range 500-600°C (932-1202°F) and therefore promotes the transformation of austenite to pearlite (ferrite + carbide) instead of to martensite. (See footnote 3.) The preheated weld is less likely to have hard zones than without preheat."

"Despite the slower cooling rate provided by preheating, the steel to be welded may yet fail to transform to pearlite during cooling. If the preheating temperature is relatively low, the heat-affected zone close to the weld may transform to martensite. . . . Preheating to a low temperature, 100-200°C which is adequate for the lower-carbon and low-alloy steels, may either prevent austenite from transforming to martensite by reducing the cooling rate or cause the austenite to change very slowly to martensite, both actions preventing cracks. Preheating to higher temperatures, 300° or 400°C (575° or 750°F, see footnote 4) which is often necessary for steels with over .30% C, prevents the formation of martensite during welding. . . . The product other than martensite to which austenite transforms in preheated welds may be pearlite or the less well known bainite. Heat-affected zones containing pearlite, even the very finest pearlite will be capable of far more deformation without cracking than zones containing martensite."

"Besides preventing hard zones or at least rendering them incapable of causing cracks under some conditions, preheating may be beneficial in reducing or preventing shrinkage stresses."

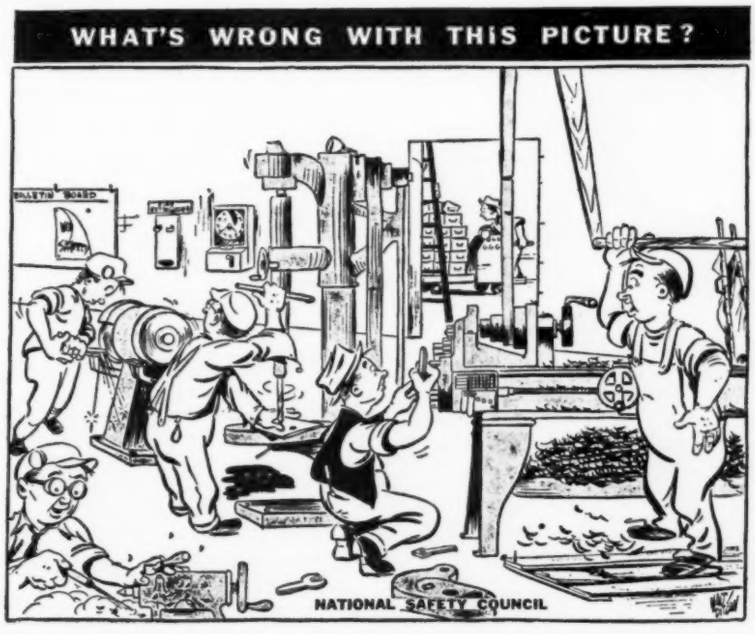
"In addition to reducing shrinkage stresses, preheating to the higher temperatures above 300°C (570°F) reduces overall distortion (upset) appreciably and reduces the yield strength of the part. Reducing the yield strength of the part relieves shrinkage strain, which, if forced to occur solely in the highly heated zone in the immediate vicinity of the weld, might lead to hot cracks in weld metal or in base metal close to the weld."

"Preheat may serve still another purpose. Stainless iron containing 16% Cr should be preheated to prevent shrinkage stresses acting on the coarse-grained weld metal and heat-affected zone at the low temperatures at which they are brittle."

The Committee on Definitions, American Society for Metals, defines Heat Treatment as follows: "An oper-

(*Continued on page* 114)

This discussion will interest state highway department shop personnel, many of which preheat parts in welding repair work. Also a few contractor executives who have large-scale repair facilities. Courtesy "Tempil Topics," published by Tempil Corp., New York 11, N.Y.



New Construction Equipment and Materials

1

4-Wheel Scrapers

The Type S 4-wheel scrapers for the past 8 years manufactured and distributed under license from Southwest Welding & Manufacturing Co., 3201 Mission Road, Alhambra, Calif., hereafter will be manufactured and distributed by that company under their own trade name "Southwest." It is claimed that loading is faster and easier with these scrapers. The "rear lift" method of control permits

Type S4-Wheel "Southwest" Scraper

the bowl to lay flat when digging. The earth is "rolled into" the bowl. Positive rolling ejection is stated to require less power and to assure accurate control of spreading depth from a thin layer to a single heap. The cutting edge extends almost the entire width of the frame, permitting close, accurate cuts to back slopes, building and retaining walls. Even load distribution, low center of gravity and balanced weight provide extreme stability and permits extremely short turns at fast speeds. Southwest 4-wheel scrapers are stated to finish side slopes easily and safely.

2

New Air Motors

Air motors of two sizes, as starters for internal combustion engines, are new being produced by Ingersoll-Rand Co., New York, N.Y. The air motor is keyed or splined to the Bendex or starting mechanism and the engine is cranked in the same manner as an automobile engine is turned over when using the electric starter. The starting motors are known as the Size 9BM and Size 20BM; the former having 9 h.p. and the latter 20 h.p. at 90 lb. per sq. in. air pressure. They have an overall length of only 13-3/16 in. and 14½ in. The air motor is of the "Multi-Vane" type and the throttle valve is of the quick-opening type to give peak horsepower almost immediately. A single step spur gearing is used to obtain suitable speeds.

3

New 32-Ton Hauling Unit

The Easton Model TB-4030 bottom-dump trailer, designed to haul 32-ton loads of bituminous coal in strip mining operations, has been added to the line of heavy-duty off-highway trailers built by Easton Car & Construction Co., of Easton, Pa. Easton bottom-dump trailers feature a radial gate, air-powered, and operated either from the cab of the tractor or from the rear of the trailer. The Easton axle and running gear design, and the Easton full-oscillating fifth wheel are based on engineering principles de-

Model TB-4030 Bottom-Dump Trailer

veloped in Easton heavy-duty side-dump mine and quarry trailers. Tires are 16:00 x 24—24 ply lug type. Brakes are 20¼ x 7 air powered.

For More Facts on These Products

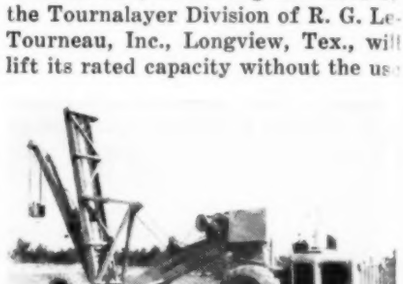
Mail inserted card, or use inquiry blank on page 119.

Or write directly to the manufacturers or their nearest distributor, referring to this issue of Roads and Streets and the item number.

4

New 7-Ton Crane

A new 7-ton crane, the Model EC-7 Tournacrane, now being marketed by the Tournalayer Division of R. G. LeTourneau, Inc., Longview, Tex., will lift its rated capacity without the use



Model EC-7 Tournacrane

of outriggers and counterweights and then carry the load either on smooth surfaces or across rough terrain. It is electrically operated and push-button controlled by one man. Model EC-7 is of similar configuration to the 15-ton Tournacrane design. The group structure, which controls the angular adjustment of the elevator track, has been so designed as to give a broad angle of deflection. This feature makes the elevator track adjustable to any angle from a horizontal position to fourteen degrees forward of vertical. There is a three-way positive electric control for pin-point spotting, lifting and placing the load. Three Tournatorque electric motors supply power. They are fed by a high capacity generator mounted in line with the engine. One motor raises and lowers the pulley block, one raises and lowers the boom, and another determines the angle of the boom track. There is still a fourth electric motor used for positive steering. The new crane offers a minimum headroom of 8 ft. 9 in. The maximum lift is 29 ft. 6 in., and it has a maximum reach behind the center line of the crane wheels of 31 ft.

5

New Scraper

A new Gar Wood Model 508 four-wheel scraper has been announced by

Gar Wood Industries, Inc., Findlay Division, Findlay, O. This cable-controlled scraper is designed for use with a single tractor of 55 or greater horsepower. Its capacity is 7.6 cu. yd. heaped, or 6 cu. yd. struck. The unit has the rugged construction and all the operating features of the larger

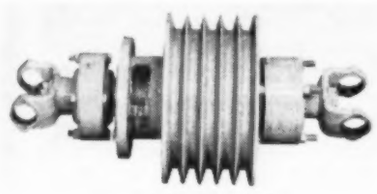
Gar Wood Model 508 Scraper

Gar Wood scrapers which have long been widely used on the tougher jobs. Model 508 takes a cut down to 12 in. below the tires, and cascades dirt up into the bowl without belaboring the tractor. The over-all width of 8 ft. 10 in. permits working in narrow cuts with good capacity. Other specifications include: wheelbase (hauling) 14 ft. 6 in.; over-all length including drawbar (hauling) 23 ft. 6 in.; bowl width, inside, 7 ft. 6 in.; depth of spread above tires, 18 in.; bowl clearance, raised for hauling, 18 in.; apron opening, 36 in; drawn weight, scraper only, 10,200 lb.

6

New Power Take-Off

A new "packaged" heavy duty power take-off to fit all standard motor trucks has been announced by Davey Compressor Co., Kent, O. Known as the Davey P-80, the new take-off is guaranteed to transmit full engine power to the driving of heavy



P-80 Power Take-Off

duty truck-mounted equipment. It contains 12 less parts than its predecessor model "Davey 75," and is 25 lb. lighter. The take-off unit itself is identical for all trucks.

The P-80 is 16¼ in. long and weighs 125 lb.

7

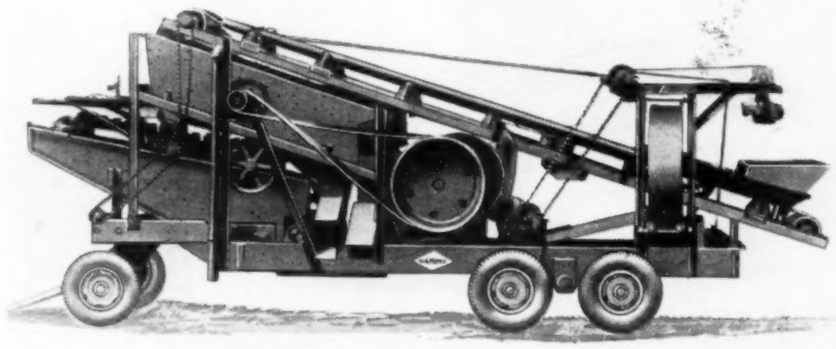
New Heavy Duty Air Hose

The development of Condor Homo-Flex heavy duty air hose for rugged service encountered in mining and quarry operations has been announced by Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N.J. This addition to Manhattan's Condor Homo-Flex Hose line can also be used to advantage in other air service requiring a super-tough type of hose. According to the manufacturer, it has an extra strong tube compounded of Manhattan Oil-proof Flexlastics, two braids of heavy strength member, and a thick abrasive resistant oil-proof Flexlastics cover, yet retains the feature of flexibility for which the Condor Homo-Flex design is noted. Two sizes, ¾-in and 1-in. inside diameters, are being made with working pressures of 350 and 300 lb.

8

New Portable Washing Plants

Two new portable washing plants have been announced by Diamond Iron Works, Minneapolis, Minn. The 1024 combines crushing with screening and washing to produce two sizes of gravel plus washed sand. The operation is straight line, with Rotorlift, employing 1024 jaw crusher, 3 x 12 drag washer, 16 x 36 plate feeder, 8 x 8 loading hopper and grizzly. The second new portable is designed for washing and screening only, and can be fed directly from the pit by dragline or shovel. This plant produces 5 sizes of washed material, employing 3-deck spray-piped vibrator. It can be used with suitable primary plant where needed. Dual pneumatic tires or steel wheels are optional on either plant.



New 1024 Plant

9

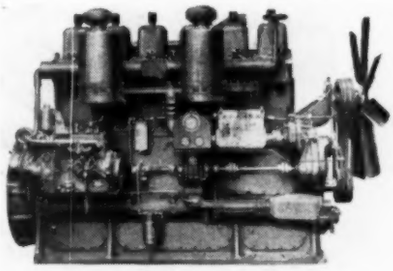
New Traffic Paint

A new special type long-wearing, quick-drying "Oncrete for Concrete traffic paint" developed particularly for marking street and highway traffic dividing lanes, safety zones, speed warning areas, parking meter zones, circles and other traffic regulating spaces is now being marketed by Lowebco, Inc., of Chicago. This new type paint dries in five minutes at 75° F. It can be sprayed on with regular traffic marking equipment. The paint is immediately available in federal yellow, traffic white and traffic black. Other colors can be developed for special purposes. Tests under heavy traffic conditions have indicated the new paint stands up under the heavy pounding of passenger cars and trucks and holds its colors fast. It is reported that in one city, traffic dividing lines were covered respectively with the new "Oncrete" paint and with ordinary white lacquer. Within a month the white lacquer line had disappeared completely, while the "Oncrete" line was in perfect condition. The test was made on paving brick which is one of the hardest surfaces on which to make paint adhere.

10

New Diesel Engine

A new diesel engine, Model 6-LRD, has been announced by Waukesha Motor Co., Waukesha, Wis. The stripped engine is rated at 300 h.p. at 900 r.p.m., or as a complete radiator cooled power unit, at 281 h.p. at the same speed. Maximum output of the stripped engine is given as 330 h.p. at 1050 r.p.m., and of the power unit, 301 h.p. at 1050 r.p.m. The engine is 8½ x 8½ bore and stroke, six cylinders, with a displacement of 2894 in. The diesel engine, Model 6-LRD, is entirely new from the crankshaft up. A large seven-bearing 5½-in. graphitic steel crankshaft is used, which is heat-treated and hardened to give crank pin and main journal hardness of 75-90 scleroscope index. The cylinder block is a husky one-piece casting into which are inserted the six hardened wet cylinder sleeves held in place by individual cylinder

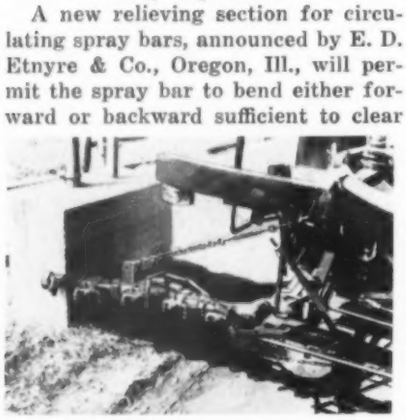


Waukesha Model 6-LRD Diesel Engine

heads and head gaskets at the top, and the usual synthetic plastic rings at the base. Cylinders are of a special hardened alloy which test 400 Brinell. The pistons are cast iron with six rings—(4) non-sticking wedge type, and (2) straight side oil control rings. A unique feature of the piston is the cooling of the piston crown by intermittent circulation of oil under pressure from the lubricating oiling system.

11
New Relieving Section for Spray Bar

A new relieving section for circulating spray bars, announced by E. D. Etnyre & Co., Oregon, Ill., will permit the spray bar to bend either forward or backward sufficient to clear



Rear View of Bar

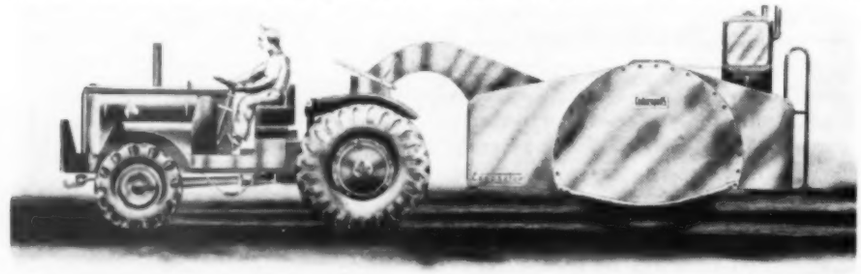
any ordinary obstruction without bending or damaging any part of the bar. Sections are available for both right and left side of spray bar next to the hinge. They can be quickly and easily substituted for the present section. Brackets and instructions are furnished. This new development is made of a solid steel accordion bellows with no joints or openings in the tube to leak. It is not affected by heat.

12
New Compaction Machine

The Cedarapids Compactor, a machine entirely new in design and principle for compacting soil and aggregate, has been announced by Iowa Manufacturing Co., Cedar Rapids, Iowa. It has been on test for three years and results show that it will produce a noticeable increase in density of soils at depths of 3 feet and more. Another important result is that it is possible to spread lifts of much greater depth and compact them to the required density. The Compactor operates on the principle of flotation of heavy loads without lateral soil displacement, aided by a vibratory action of forces producing a directional depth penetration of pressure. This combination produces maximum compaction and density satisfactory for construction specifications without affecting the top surface. The Compactor can easily be adjusted to meet the requirements of different soil conditions by changing tire pressure or weight of the unit. For deep penetrations, maximum weight and tire pressure are required while on surface compaction such as 6-in. to 18-in. depths, the tire pressures and weights must be reduced to a point where lateral displacement is the least. The vibratory action which produces a tamping action through the tires is created by a vibrator unit mounted on the axle and held down by super-imposed springs. Power for operating the vibrator is supplied by a 35 h.p. engine. By means of an adjustable governor, the vibrations can be controlled through a range of 700 to 1400 cycles per minute depending on soil requirements. The Compactor will assure excellent compaction as a rubber-tired roller without the engine running but with vibratory action an additional 3 to 10 per cent additional compaction is produced. The Compactor may be towed by either rubber-tired or track-type tractors at speeds from 1 to 2½ miles per hour. Two sizes are offered—one weighing 60,000 lb. and the other 25,000 lb. when fully loaded. The "60" is 19′ 7″ long, 9′ 2″ wide, and 9′ 1½″ high and has two 24:00 x 32 36-ply smooth tread tires. The "25" is 15′ long, 9′ 2″ wide, and 7′ 6″ high and has four 10:00 x 20 tires.

13
New Lift Truck

A new idea in placement of the operator and his controls has been incorporated in the design of the Wagnermobile Duo-Way Lift, a heavy duty lift truck developed by Mixermobile Manufacturers, Portland, Ore. The driver sits crossways in the machine. Visibility and control of the load is stated to be greatly improved, and the operator enjoys greater comfort. The new unit weighs 14,500 lb. and has a rated capacity of



Cedarapids Compactor

Wagnermobile Duo-Way Lift

16,000 lb. Mounted on a tricycle running gear, the truck is a front-wheel-drive using a Timken L-DPH-100 differential with 900 x 20 dual tires. Hydraulic power steering is adapted to the tail wheel for fast maneuvering. All controls for operating the machine are conveniently grouped in the operators' position; and all are hydraulic controls except the carriage hoist control, which is mechanical. Loads are cable lifted by means of a roller bearing carriage, on the hoisting track. The track is pivot mounted at its base to provide for tilt of seven degrees forward and fifteen degrees to the rear.

14
New Welding Machine

A new Wilson "Wasp Special" air-cooled, engine driven arc welding machine announced by Air Reduction Sales Co., New York, N.Y., is designed to furnish a smooth, steady current and to stand up under usual and regular duty factor load conditions in tough construction and maintenance jobs in many variod applications. This new 200 ampere arc welder has a welding range of 25 to 250 amperes at 30 volts, 50% duty cycle. It is a light weight machine that is easy to handle. Two convenient outlets are provided which may be used for lighting purposes or to operate universal power tools in an emergency.

15
New Pulverizer

A new large capacity pulverizer developed by Lippmann Engineering Works, Milwaukee, Wis., is stated to be capable of producing 170, and

Pulverizer or Trailer on Ag-Line Job

more, tons of ag-lime per hour, 90-100% passing 8 mesh screen.

The machine is 32 in. x 48 in. and requires about 320 h.p. to produce the capacities mentioned. The feed opening is 22 in. x 50 in. permitting the passage of large rocks for primary crushing purposes.

16
New 25 Ton Bulldozer

A new 300 h.p., 4-wheeled, rubber-tired bulldozer, the B Tournadozer, now in production at the R. G. LeTourneau, Inc., plant, at Longview, Tex., has electrically-operated blade control and a top speed of 13.6 m.p.h. both forward and reverse. The electricaly-operated control is a 240 volt, 120 cycle A.C. Tournatorque electric motor working through a gear reduction box. The motor brake, an integral part of the motor assembly, locks

LeTourneau Model B Tournadozer

the blade in the desired position upon the release of the blade control switch. The brake unit is a spring-loaded, multiple disc brake, released automaticaly by electro magnets as the hoist motor is operated. The motor is reversible, controlled by a finger-tip switch located near the operator's right hand. Specifications include: Tournamatic transmission with air synchronized disc clutch steering; two wheels on each side controlled by air-actuated disc clutches and brakes; height blade can be raised above ground 3 ft. 10 in.; single drum, electric motor operated power control unit; approximate shipping weight, 50,700 lb. Overall dimensions are: width (blade mounted) 13 ft. 10 in.; length, 19 ft. 7 in.; wheelbase, 7 ft. 6 in.; gauge, 8 ft. 10½ in.

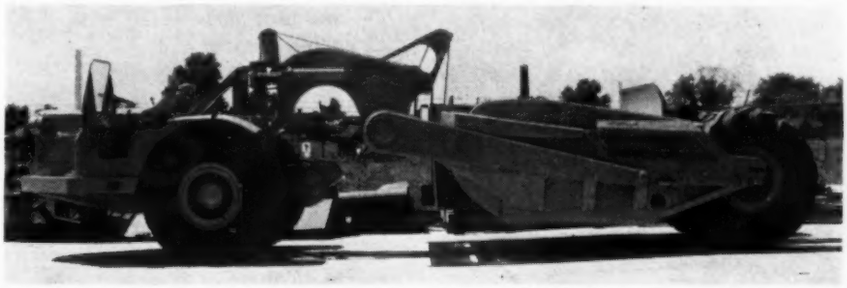
17
New Blasting Cap

A new waterproof and gasless Western ventless delay electric blasting cap, used for rotation firing of successive shots, has been announced. Manufactured by Western Cartridge Co., at East Alton, Ill., a division of Olin Industries, Inc., the new cap is made in ten delays from No. 1 to No. 10. A zero delay cap is also made to provide eleven intervals of delay. Like Western's previously announced "Big Inch" blasting cap, the new electric delay cap employs RDX (cyclonite) as its explosive charge.

18
New "Caterpillar" Equipment

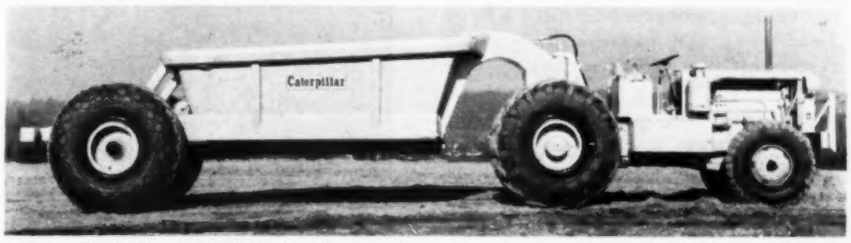
Ten new products were announced for the first time at the ARBA Road Show by The Caterpillar Tractor Co., Peoria, Ill. They were:

The "Caterpillar" Diesel DW21 2-wheel tractor and its design-matched "Caterpillar" No. 21 scraper; the "Caterpillar" Diesel DW20 4-wheel tractor, equipped with the "Caterpillar" W20 wagon; the "Caterpillar"



"Caterpillar" Diesel DW21 Equipped with "Caterpillar" No. 21 Scraper

No. 40 hydraulic controlled scraper—designed for use with the long established "Caterpillar" Diesel D4 track-type tractor; the "Caterpillar" No. 90



"Caterpillar" Diesel DW20 Tractor Equipped with "Caterpillar" W 20 Wagon

scraper—designed for use with the recently improved "Caterpillar" Diesel D8 track-type tractor; the "Caterpillar" Diesel D397 engine, a 500 hp V12 engine with blower; the "Caterpillar" Diesel D386 engine, a 400 hp V12 engine; the "Caterpillar" Diesel D375 engine, a 334 hp V8 engine with blower; the "Caterpillar" Diesel D364 engine, a 267 hp V8 engine.

Both the new earthmoving units—the Diesel DW21 with the No. 21 scraper and the Diesel DW20 with the W20 wagon—are powered by a new "Caterpillar" diesel engine, a 6-cylinder power plant providing 225 hp at 2,000 rpm governed full load speed.

The two-wheel DW21 has five forward travel speeds, ranging from 2.6 mph in first gear to 20.6 mph in fifth gear, and one reverse of 2.9 mph.

Preliminary specifications show that the tractor-scraper combination will have an overall length of 39'7", width of 11'6", height of 10'8", and a wheelbase of 24 ft.

The cable-controlled No. 21 scraper has a struck capacity of 14.5 cu. yd., a heaped capacity of 18½ cu. yd., and a 9'6". cut.

The DW20 also has five forward and one reverse travel speeds. It has a travel speed of 3.26 mph in first speed and ranges up to 26.0 mph, while reverse speed is 3.6 mph.

The 4-wheel tractor has a wheelbase of 127 in., front tread of 88 in., and rear tread of 84 in. The overall length of the tractor with matched wagon is 42', width 10'8", and height 8'8". The bottom dump W20 wagon has a struck capacity of 14.0 cu. yd. and a heaped capacity of 22 cu. yd.

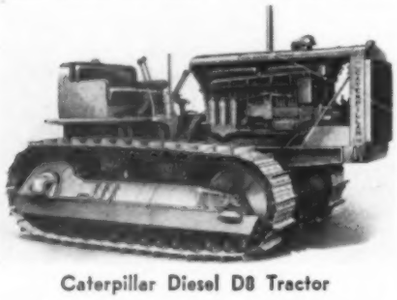
The new hydraulic-controlled No. 40 scraper has a struck capacity of 3.6 cu. yd. and a heaped capacity of 4½ cu. yd., while the No. 90 has a struck capacity of 21.2 cu. yd. and a heaped capacity of 27 cu. yd. The No. 40 has an overall length of 21'½", width of 7'5½", and a 6' cut. It has a wheelbase of 13'10" and requires 19' for a non-stop turn. It is designed for use with the "Caterpillar" hydraulic system.

The No. 90 is 40 ft. long overall, has a width of 12 ft. and a height of 10½ ft. It has a wheelbase of 25'3¾", and requires 31'7" for a non-stop turn. It has a front gauge of 81 in., a rear gauge of 86 in.

The four new "Caterpillar" diesel engines, each of which will be available as industrial power units, electric sets and marine engines, have bore and stroke of 5¾ x 8 in., and a full load speed range of 800 to 1200 rpm to provide increased power outputs ranging as high as 500 hp, maximum output of the V12 D397. All four have a 60 degree "V" arrangement. Each is 48½ in. wide and 70½ in. high. The two V8 engines are 88-5/16 in. long, while the 12-cylinder D386 is 108-9/16 in. long, and the 12-cylinder D397 is 112½ in. long.

19
Improved "Caterpillar" Tractor

An improved "Caterpillar" diesel D8 track-type tractor, featuring 130 drawbar horsepower and constant mesh transmission, has been placed in production by Caterpillar Tractor Co. Peoria, Ill. The new five-speed transmission, with three speeds in reverse, has helical cut gears and sliding jaw collars mounted on heavy-stiff shafts that turn on large capacity roller



Caterpillar Diesel D8 Tractor

bearings. A separate gear-type oil pump, providing pressure lubrication for the bearings and an oil spray over the gear, is provided for the new transmission and is driven off the upper transmission shaft. A powerful, lightweight master clutch with a large diameter brake reduces inertia for faster shifting. Two gear shift levers are provided—one, a conventional shifter lever for speed selection; the other a forward and reverse lever for reversing travel direction in the first three speeds. A swinging gate type of interlock prevents slipping out of gear when the master clutch is engaged. Another refinement scheduled for the D8 is a new drum-type front idler that strengthens the rim. The new D8 is applicable with a full line of auxiliary equipment built by "Caterpillar," Athey, Hyster and Trackson —"Caterpillar" scrapers, bulldozers and rippers, as well as wagons, sidebeams, winches, logging arches, the Hystaway and cranes.

20
New Front End Loader

A new front-end loader announced by Arrow Contractors Equipment Co., Chicago, Ill., is compact enough to work inside freight cars. It has a bucket capacity of 8 cu. ft., with clearance of 4½ ft. for loading the

Arrow Scooter Loader

new type power dump carts as well as mixer skips. The drive is to the front wheels, on which the weight of the machine and its load are centered for maximum traction and ease of control. Caster-type rear wheel enables the loader to turn in its own length. Its transmission provides 4 forward speeds for a complete range of power and travel up to 15 mph, plus one reverse speed which is needed only for backing before turns. Traction-grip pneumatic tires provide ample traction on soft or sandy ground. The machine is powered with 9 h.p. air-cooled engine.

21
Ford Motor Co.

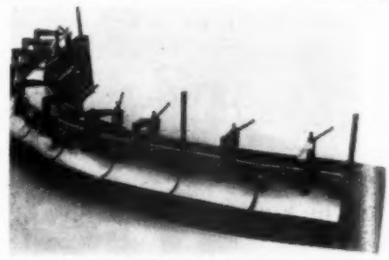
Ten new 1948 model Ford trucks were displayed at the Road Show by the Ford Motor Co., Detroit, Mich. They ranged in capacities from the series F-1 of 4,700 lb. gross vehicle weight to the F-8 of 21,500 gross vehicle weight and were equipped with virtually every type of road building

New Series F-7 Truck

device. Outstanding are the two new series F-7 and F-8 with maximum gross vehicle ratings of 19,000 and 21,500 lb., respectively. They were added to the Ford truck line this year and are the largest the company has ever built. These "big jobs," equipped and adapted for road building work, dominated the Ford exhibit. Another new series in the Ford truck models for 1948 is a six-cylinder, cab-over-engine model. The 1948 trucks are powered by three new truck engines—a 95 h.p., six cylinder engine, a 100 h.p. V-8 and 145 h.p. V-8.

22
Improved Flexible Form

The flexible steel form that has been produced throughout the last decade by The Heltzel Steel Form and Iron Co. of Warren, O., is now being made with an important improvement. The method of locking face forms and back forms together with division plates can be eliminated. The new development supports face forms by means of overhead hangers. The overhead hanger permits concrete curb construction of any length without breaks or scoring of the concrete. There is ample clearance beneath the overhead hanger for hand finishing. Position of hangers on the form is adjustable, within the section length, to allow for obstacle interference.



Heltzel Flexible Steel Form with Overhead Hangers

The overhead hanger is one of three optional face curb form supports—the other two being full depth division plates or skeleton division plates. Heltzel curb and gutter forms are made of No. 11 gauge, high carbon steel in sections 10 ft. long, of either straight or battered face construction.

MANUFACTURERS' LITERATURE

23
Rock Bits

Its newly-announced line of chisel-type cemented carbide rock bits for pneumatic percussion drilling is described in Catalog RB-1, published by Kennametal, Inc., Latrobe, Pa. The catalog contains information on the new sizes of 1⅜ in., 1½ in., 1⅝ in., 1¾ in., 2 in. and 2¼ in., describes them in detail, and points out the advantages claimed for drilling with Kennametal cemented carbide bits.

24
Power Shovel

A 12-page, 2-color illustrated bulletin on its Type 111-M machine has been published by Marion Power Shovel Co., Marion, O. The Type 111-M with Marion air control is a 3½-4 cu. yd. machine. Among many features and refinements claimed for the clutch-type diesel machine is electric swing. The electric swing unit, known technically as the vertical swing, propel, and boom hoist unit, is of relatively simple design, consisting of a vertical swing motor mounted on a gear reduction unit, with shafts mounted on anti-friction bearings and gears lubricated by a circulating oil pump. The selection of swing, crowd or boom hoist drive is by means of jaw clutches. The Twin Six G.M. diesel engine is direct-connected to the generator which supplies power for the compact electric swing unit.

25

Power Grader

Bulletin No. 141 on its new power grader has been published by Meili-Blumberg Corporation, New Holstein, Wis. The bulletin illustrates the M-B power grader operating with such attachments as a power sweeper, scarifier, snow plow, and equipped with leaning wheels and extra large rear tires. Complete specifications for both the 40 H.P. gasoline or Diesel powered models are provided.

26

Bucket Loaders

Two heavy-duty bucket loaders featuring 3-yd. elevator, hydraulic boom hoist, and a 16-to-1 ratio between high and low working speeds are described and illustrated in a new bulletin released by N. P. Nelson Iron Works, Inc., Clifton, N. J.

27

Roll Crushers

"Crushing Power," a new catalog on roll crushers, has been prepared by the New Holland Manufacturing Co., Mountville, Pa., a division of the New Holland Machine Co. Photographs and diagrams illustrate the performance of New Holland roll crushers. Included are special tables showing how to get the most efficient roll crushing. They contain complete specifications, maximum feed sizes, horsepower and capacity figures for each model.

28

Automatic Spray Machine

A new bulletin completely describing operations of the Flex-Plane automatic spray machine for applying membrane curing material to concrete roads and airports is now available from the manufacturer, Flexible Road Joint Machine Co., Warren, O. Included also are the four attachments, which can be placed on the basic spray machine to broom, belt, drag burlap or install permanent traffic lines. These attachments can be placed in position in the field and are interchangeable.

29

Flexible Tubing

Complete data on the new Penflex Twin-Lok flexible metal hose has been prepared by Pennsylvania Flexible Metallic Tubing Co., Philadelphia, Pa. It shows how this new smooth bore hose can be used . . . materials used in making it . . . specifications and weight . . . and the couplings used in connecting installations.

30

Rotary Dryer Screener

A 4-page bulletin on its rotary dryer screener has been issued by Mines Equipment Co., Dept. 28, 4215 Clayton Ave., St. Louis, Mo. Designed to operate on the "counter-flow" direct heat principle, maximum thermal efficiency (lowest heat transfers losses) is obtained in the dryer screener by passing heat from the combustion chamber directly into its rotating drying cylinder. Heat from exhaust gases are utilized to preheat hopper containing the incoming wet sand.

31

Welding Rods

An illustrated 4-page bulletin published by Eutectic Welding Alloys Corporation, New York, N.Y., contains concise information on the outstanding welding rods for use in every shop. The bulletin has been scientifically arranged according to metals and lists those rods which are designed specifically for each metal application. It lists tensile strength, bonding temperatures, sizes available, and outstanding characteristics of each rod. The bulletin contains exact suggestions for avoiding high heat welding problems and stresses methods for lessening distortion.

32

Highway Shoulder Improvement Methods

A booklet outlining the improvement of highway shoulders has been issued by Seaman Motors, Inc., Milwaukee, Wis. The text begins with a brief analysis of the scope of the shoulder problem as it is today. Next follows a step-by-step outline of procedure covering several types of "traffic resistant" turf shoulders to serve both safety and utility for occasional or emergency traffic. Also included are types of border strips or pavement edgings to carry a portion of the main traffic. The application of the Seaman Pulvi-Mixer in the construction of the various types is emphasized by both text and illustrations.

33

Dumptor Bulletin

"Cutting Haul Costs with Koehring Dumptors" is the title of a new bulletin prepared by the Koehring Co., Milwaukee, Wis. More than 55 photographs and illustrations graphically describe the story of low-cost off-road material hauling in industrial, mining, construction, quarry and road building work. The 28-page booklet includes time study results, production charts, specifications, cut-away photographs and drawings that point out operating advantages of the Dumptor. In addition, action pictures explain answers to such timely questions as extra yardage hauls, saving haul time, lower maintenance costs and the one-second gravity dump features employed by the fast-moving Dumptor. Mechanical features are outlined and described in detail.

34

Valve Lubrication Booklet

"Internal Combustion Engine Valves" is the title of a comprehensive article in the July, 1948, issue of *Lubrication* published by the Texas Company.

This eleven-page article includes a discussion of valve failures and their causes, facts equipment purchasers and shop managers should know about valve faces and seats, valve stems and guides, poppet clearances and many other subjects.

Reprint of this article can be obtained free by writing to the Texas Company, 135 E. 42nd St., New York 17, N.Y.

Road Show

(*Continued from page* 84)

missible. Paul B. Rynning, reporting for the committee on county highway standards, said that while certain standards are considered essential, it is impossible to work up a set of even minimum standards that will govern all county road work everywhere.

City Men Talk Upkeep

The Road Show was the occasion also for turning renewed attention to the rising tide of highway and street maintenance need. In the Municipal Division meeting, with president J. B. Wilson of Louisville presiding, Wright S. Cockcroft, superintendent of construction, St. Paul (Minn.) department of public works, warned that serious loss will result if the maintenance needs of asphalt built pavements on roads and streets in the past years are not met in time and by proper methods. Along with Raymond F. Washendorf and Charles E. Brokaw of Cincinnati, he devoted attention to some of the technical details of pavement maintenance. Sealing, while a widely familiar procedure, must be adapted to the climatic and service needs, he warned. Today's equipment is adequate if properly used. Much difference of opinion still exists on the grade of bitumen, and other details of sealing practices.

Excellent Technical Sessions

Education and ARBA student-chapter day, Sunday, included a talk by A.

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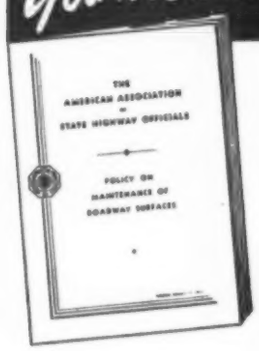

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Diefendorf, University of Utah, president of ARBA's educational division, on the value of student chapters in technical schools. A committee report on highway engineering curricula in engineering colleges was given by Joe E. Butler, Missouri school of mines. Professor Butler's questionnairing of schools revealed that only one-half of the schools replying offer courses in soil mechanics, a few offer no material on the subject, one-third offer highway engineering as a major for an M.S. degree, most schools have good contacts with highway departments, but that inducements to enter highway work are comparatively poor compared with the outlook for advancement and success in other branches of engineering.

Professor Ben H. Petty of Purdue University made a committee report on the purposes of highway conferences and short courses. Beginning Monday and running through several sessions, Harold W. Richardson, of *Construction Methods*, presented a specially prepared series of lectures on equipment fundamentals under the auspices of the Educational division of ARBA.

Space will not permit naming all the many speakers who appeared on succeeding days. But especially notable is the series of technical summaries presented by members of the Public Roads Administration's Washington staff. Much credit should go to Commissioner Thos. H. MacDonald and the two score staff members who collaborated on this series, entitled "A Discussion of Highway Practices in the United States." Presented specially for the benefit of foreign guests, this series has been published by ARBA in four 48-page pamphlets, covering, respectively, highway development, administration and financing; planning highway systems and development of standards; highway location and design of foundations, drainage and surfacing; and highway construction and maintenance.

Two technical sessions on compaction of soils were held, continuing the series of meetings last held in San Francisco [May and June '48 R and S]. An edited transcript covering the remarks of a score of speakers, will be available later to association members.

Engineering Advancement

A committee whose work, while not of spectacular appeal to working members, is of the greatest importance, is the committee on advancement of highway engineering. One of the many ARBA committees to make a brief report, this group under C. R. Hanes of Ohio reported findings of a questionnaire on the discouraging lack of interest shown by students in entering

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highway work, and what the highway departments can do to improve the situation.

Another committee to make an exceptionally able report was that on highway location, surveying and mapping. Chairman R. Getty Browning, chief locating engineer, N. Carolina, summed up the contents of some twenty separate sub-committee reports on such topics as maps, traffic surveys, tunnels, etc. These excellent papers, too, will be available later in published form.

At the close of the Show the directors of ARBA approved three resolutions, which urged full use of the $100,000,000 made available for airports (only $37,000,000 taken up to date); asked that Congress pass remedial legislation to clear up the confusion now existing on the basing-point pricing of cement and other commodities; and urged on behalf of contractors that something be done to eliminate payment of "overtime on overtime" now required under a recent supreme court ruling.

The Construction Industries Association in its annual meeting voted in a new board consisting of Ralph Stiles, exec. vice-president, Austin Western Co.; B. T. Devine, exec. vice-president Chain Belt Co.; Henry Schramm, pres. Schramm Co.; Arthur Levison, vice-president, Blaw-Knox; Frank H. Moline, special representative, Pacific Car & Foundry Co.; Marshall Noel, vice-president, Allis-Chalmers Mfg. Co.; and P. H. Birckhead, vice president, Bucyrus-Erie Co.

Mechanized Shoulder Crew

(*Continued from page 76*)

shoulders along all of the principal routes of the state highway system. The ten district superintendents have been instructed to concentrate their forces on the type of work pictured here, and particularly along those routes on which the surface is only 18 ft. in width.

Approximately 275 miles of shoulder repair work had been completed to June 15, and a continuous maintenance program is now established which will mean a great deal to the traveling public as a factor of safety. Improvement in drainage and run-off of rainfall is also accomplished and a decided improvement in the general appearance of all sections treated is obtained.

District men consider it essential that all available local materials be used, such as sand, gravel, concrete salvaged from repair work, and materials salvaged from runways of abandoned airfields, in order that expenditures for this type of work be kept at a nominal cost so as to repair as many miles as possible with limited funds.

To date 25 miles of our shoulders have been compacted with pneumatic rollers and followed with a treatment of asphalt.

WITH THE MANUFACTURERS & DISTRIBUTORS

Elected President National Carbide

J. Carl Bode, formerly operating manager, has been elected president of National Carbide Corporation. He succeeds L. A. Hull who becomes chairman of the board of directors. Mr. Bode, a graduate of the University of Wisconsin, joined National Carbide in 1928. In 1935 has was appointed superintendent of the Keokuk (Iowa) carbide plant. In 1941 he was appointed works manager at Louisville, a position he held until 1945 when he came to New York as assistant operating manager. In 1947 Mr. Bode was appointed operating manager.

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New Davey Dealer

Davey Compressor Co., Kent, O., has appointed Evans Machinery & Equipment Co., 770 S. Schuylkill Ave., Philadelphia, Pa., to a class "A" dealership. The Evans sales territory will include the following on an exclusive basis: Pennsylvania counties of Chester, Montgomery, Bucks, Delaware and Philadelphia. New Jersey counties of Burlington, Ocean, Camden, Gloucester, Atlantic, Salem, Cumberland and Cape May. In addition the new dealer will operate in this territory on a non-exclusive basis: Pennsylvania counties of Tioga, Bradford, Susquehanna, Wayne, Wyoming, Lackawanna, Pike, Montour, Northumberland, Columbia, Schuylkill, Luzerne and Carbon. Delaware, county of Newcastle.

New GM Diesel Distributor

Earle Equipment Co., Detroit, Mich., has been appointed distributor of General Motors Series 71 diesel engines. Founded in 1909 by the late Horatio S. Earle, Michigan's first highway commissioner, the company has continuously served contractors in Michigan for 39 years. According to John R. Earle, General Manager, extensive building alterations are under way to accommodate the sales and service activities of the new GM diesel department in both Detroit and Grand Rapids.

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New Marion District Manager

S. R. Shepard

Marion Power Shovel Co., Marion, O., has appointed Stanley R. Shepard district manager of its newly-arranged Upper New York State District. His headquarters are at 225 Hansen Ave., Albany, N.Y. Mr. Shepard is well known in the shovel and crane field, having been associated with the sales department of a manufacturer of excavating equipment for 23 years. He has been active in civic groups and various construction associations in Albany, where he has lived for more than 20 years. During World War I, Mr. Shepard served as a testing engineer and expediter for The Lincoln Electric Company of Cleveland, Ohio. During World War II, he was assigned to the position of chief expediter of materials in the plant of an excavator manufacturer. Mr. Shepard's industrial background also includes experience as a sales engineer for a Cleveland, O., manufacturer of large power apparatus.

Appointed District Representative

C. W. Scholvin

C. W. (Bill) Scholvin has been appointed district representative for the LaPlant-Choate Manufacturing Co., Inc., Cedar Rapids, Iowa in the following area: New York, Pennsylvania, Maine, Maryland, New Hampshire, Connecticut, and the eastern part of Canada. Bill is well known throughout the construction trade as he was formerly the LeTourneau representative for the Middle Atlantic States.

New Richkraft Sales Representative

The Richkraft Co., Chicago, Ill., has announced the appointment of John H. Huston as sales representative in Michigan, Indiana and Northwestern Ohio. Mr. Huston is located at 18975 Stansbury St., Detroit, Mich. He was formerly district manager for U.S. Gypsum Co. in the Detroit and Pittsburgh areas.

Crafts Joins Universal

L. H. Crafts

L. H. Crafts has been appointed vice president and general sales manager of Universal Motor Co., Oshkosh, Wis. He is widely known in the industry having been general sales manager of the Automotive, Industrial and Marine Division of Lycoming Manufacturing Co. for a number of years and later eastern sales manager of the Buda Co. Mr. Crafts left the Buda Co. to take charge of the Washington office of the Sterling Engine Co. as assistant vice president during the war and served as a member of the Internal Combustion Engine Section of the War Production Board. Following the war and prior to joining Universal he has been acting as sales manager of the Curtis Marine Co., Inc., Norfolk, Va., handling the sale of gasoline and diesel marine and industrial engines.

Schultz Promoted by Nordberg

R. R. Schultz

R. R. Schultz has been promoted to sales manager of Crusher and Process Machinery Divisions of Nordberg Manufacturing Co., Milwaukee, Wis. He joined Nordberg in 1938 as a sales engineer and served a year in the Canadian Branch office at Toronto. He was promoted to assistant sales manager in 1946. From 1942 to 1945 he served as Captain, Corps of Engineers, U. S. Army. Prior to coming to Nordberg he was associated with the Traylor Engineering and Manufacturing Co. of Allentown, Pa.

Joins Timber Engr. Co.

J. C. Garrison, structural engineer, has joined the engineering department of the Timber Engineering Co., Washington, D. C. Graduating this year in civil engineering from Virginia Military Institute, Mr. Garrison previously served in the engineering staffs of the J. D. Hedin Construction Co. and the District of Columbia Highway Department. Entering the U. S. Navy in 1944, Garrison served two years on the U. S. S. Alabama and U. S. S. Massachusetts.

Gorman-Rupp Officials Elected

Election of three new vice-presidents has been announced by J. C. Gorman, president of the Gorman-Rupp Co., Mansfield, O., manufacturers of centrifugal pumps. The new officers are Warren E. Rupp, formerly chief engineer; Walter O. Buehler, who recently resigned as vice-president of the Carver Pump Co., and Kenneth H. Cadigan, former sales engineer of the company. These appointments are a part of the plans for enlarging the operations of the company to include a complete line of centrifugal pumps for industrial and municipal applications. The design and development of the new products will be under the direction of Mr. Buehler.

Ford Appointment

George M. Catchpole has been appointed assistant manager of the fleet sales section, Ford Motor Co. He was formerly Denver district truck and fleet manager, and has been with the Ford Motor Co. in the Denver district office since 1935. He served as zone manager from 1936 to 1941 when he entered the Army Air Forces. He saw service in Italy and Africa and returned to the Ford Denver district after being discharged on Sept. 11, 1945.

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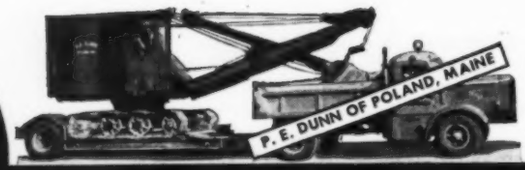

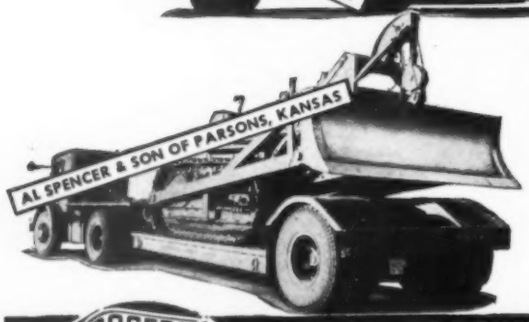

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The "Tagalong" front loader loads and unloads from the front after trailer is easily disconnected from the dump truck, and it can be a "one man operation" performed in short time.

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Heiple Promoted by LeTourneau

D. Heiple

Danforth K. Heiple has been promoted to chief field engineer for R. G. LeTourneau, Inc., Peoria, Ill. In his new duties he will give sales assistance to LeTourneau Distributors in planning equipment applications and compilation of earthmoving production and cost. Heiple was graduated from Purdue University in 1941 with a B.S. degree in Mechanical and Civil Engineering. During World War II, he joined the Naval Aviation Engineers, where, for a time, he served as officer in charge of service and maintenance of aircraft aboard the U.S.S. Enterprise. Discharged in 1945, he came to LeTourneau as field engineer. He succeeds R. C. Lewis, resigned.

Presstite Adds New Sales Office

Presstite Engineering Co., St. Louis, Mo., manufacturers of specially engineered materials for sealing out moisture for the construction, automotive, refrigeration, railroad, and aviation industries, has expanded its service facilities through the addition of two new sales offices. An East Coast office with James W. Bampton in charge has been opened in the Times Medical Bldg., Philadelphia. Harry A. Lowry has opened a West Coast sales office at 5960 Willowcrest Ave., North Hollywood, Calif.

Preheating for Welding Is Heat Treatment

(*Continued from page* 103)

ation or combination of operations involving the heating and cooling of a metal or alloy in the solid state for the purpose of obtaining certain desirable conditions or properties."

Preheating for welding thus deserves properly to be included as a Heat Treatment term, alongside of normalizing, annealing, tempering, spheroidizing and others.

1. See TEMPIL° Preheating Chart listing recommended preheat for 79 commercial metals and alloys. Available on request without charge.
2. Published by the American Welding Society.
3. See TEMPIL° "Basic Guide to Ferrous Metallurgy" for definitions and boundaries of critical temperatures. This 16" x 21" plastic-laminated wall chart in colors is available on request without charge.
4. TEMPILSTIKS° are a convenient way of checking temperatures in this range. Sample TEMPIL° pellets are available on request.

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2—Roscoe 1000 Gal. Dist. 12' SB—1 Skid Mounted—1 Truck Mounted
1—Grace Tank Car Heater
1—1 Yd. W'ms Rehandling Clam
1—Master #76 Electric Vibrator
1—Lakewood Subgrade Planer 18-2091

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Continental 12 H.P. P.U. w/ Clutch
Continental 20 H.P. P.U. w/ Clutch
Continental 74 H.P. P.U. w/ Clutch
Case 28 H.P. P.U. w/ Clutch
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Two units: 15x24 primary, 2x8 apron feeder and by-pass grizzly. 24x16 secondary, 3x8 vibrating screen, delivery and sand conveyor. Powered by 110 H.P. Buda gas engine.

Unit ¾ yd. shovel.

All the above two years old.

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7'0x3' rear broom, 42" gutter broom, pneumatic tires, sprinkler system.....$1,800.00

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40—16 Cu. Ft. 18" Gauge—Mine Cars
40—Std. Gauge ore cars—50 ton
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Smidth—Rotary Kiln—Suitable for Sintering
Rod Mills—6'6"x12'
30" Superior McCully Gyratory Crusher
Jaw Crushers—24"x36"—18"x36"—25"x40"—42"x48"—60"x42"—others
Cone Crushers—3' and 4' Symons
Al. Ch. Type R-No. 848 Gyratory crusher
13" Superior McCully—Gyratory crusher
Roll Crusher 54"x20"—24"x48"
Screens—5'x14'—4'x14'—Sgl. Dbl. Dk.
Also flat deck screens
Pan Feeders—30"x5'
Dorr Classifier—8'x26'
Diesel Driven—Cent. 1000 GP—280 ft.
Deep Well Pumps—2280 GPM—280 ft.
Sul. and I. R. Double Drum Tugger Hoists
Ottumwa Hoist—100 HP 450 ft. Cap—Sgl. Drum
Ottumwa—150 H.P.—1⅛" rope—National 200 H.P. ⅞" rope—Flory 225 H.P. 1" rope.
Wellman—225 H.P. Double Drum—585 FPM
Motors—112 H.P. 500 RPM—150 H.P. 600 RPM—100 H.P. 1800 RPM—100 H.P. 900 RPM
Transformers—33,000 to 2,300—100 KVA 165 KVA 22000 to 440—20000 Pri. to 2500—200 KVA. Others
New 30" troughing idlers—bargain
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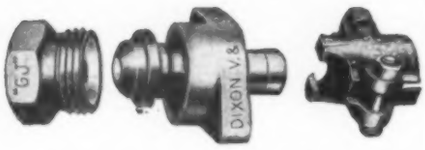

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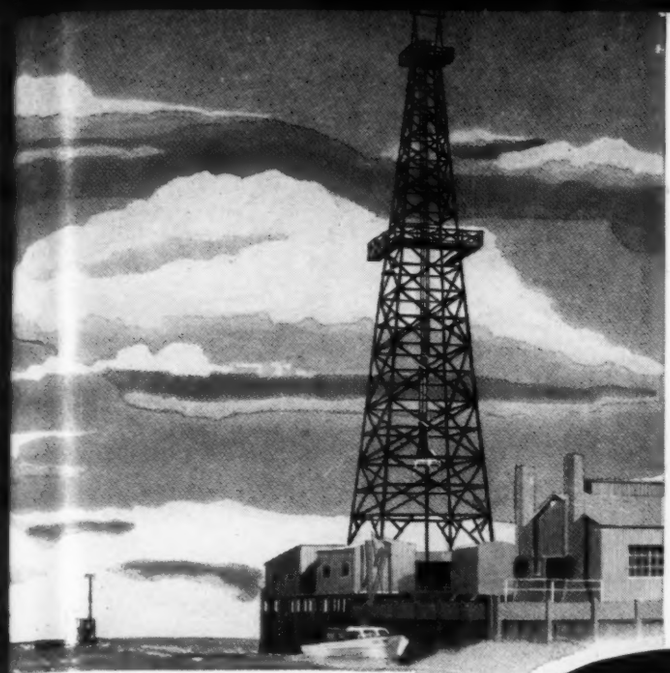

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